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SERVICE DELIVERY INDICATORS

Education | Health

# Education Service Delivery in UGANDA

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# Africa
# Education Service Delivery in Uganda
## Results of 2013 Service Delivery Indicator Survey

March 2016

GEDDR and GHNDR
AFRICA

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# EXECUTIVE SUMMARY

The Service Delivery Indicators provide a set of metrics for benchmarking service delivery performance in education. The overall objective of the indicators is to gauge the quality of service delivery in primary education and track performance. The indicators enable governments and service providers to identify gaps and to track progress over time and across countries. It is envisaged that the broad availability, high public awareness and a persistent focus on the indicators will mobilize policymakers, citizens, service providers, donors and other stakeholders for action to improve the quality of services and ultimately to improve development outcomes.

This report presents the findings from the implementation of the Service Delivery Indicators in the Education sector in Uganda in 2013. Information was collected from 400 primary schools; 2,197 teachers who were assessed for their skills in English, mathematics and pedagogy; 3,803 teachers who were assessed for absence rate; and 3,966 pupils who were assessed on their English, mathematics, and non-verbal reasoning skills. The survey was given in Kampala, as well as the Central, Eastern, Northern and Western regions of the country. The results provide a snapshot of the quality of service delivery and the physical environment within which services were delivered in public primary schools. The survey provides information on three levels of service delivery: measures of (i) teacher effort; (ii) teacher knowledge and ability; and (iii) the availability of key inputs, such as textbooks, basic teaching equipment and infrastructure (such as sanitation, quality of lighting, etc.).

## Teacher knowledge and ability: What providers know?

There were significant gaps in provider knowledge among both public and private teachers in the education sector. Only 1 in 5 (19.5 percent) of public school teachers showed mastery of the curriculum they teach. Years of education and level of teacher training were positively correlated with higher teacher scores. The Northern region and rural areas consistently and significantly lagged behind the other regions and urban areas in measures of the knowledge and competence of teachers.

## Teacher effort: What providers do?

In the education sector, the problem of low provider effort was largely a reflection of suboptimal management of human resources. This was evidenced by the findings that 1 out of 4 (23.3 percent) teachers in public schools were not at work. Of those who were in school, 52.3 percent were not in the classroom. The result was 47.7 percent of public school teachers at any point in time were not teaching. By extrapolation, the average public Primary 4 pupil in the North received only 50 actual days of teaching time during the school year, about 90 days fewer than her Kampala counterpart.

## Availability of key inputs: What providers have to work with?

Schools had some of the basic inputs and equipment to function properly, but a few serious challenges remained. No textbooks were used by pupils in 94.4 percent of the classes in public schools. While the observed use of textbooks by pupils in public schools was very low at 5.6 percent, public schools--contrary to expectations--actually fared slightly better than private schools, where the use was virtually non-existent at 1.2 percent.

## Variations across regions and ownership

Teachers in private schools did not consistently outperform their counterparts in the public sector in measures of ability. Indeed none of the differences in the scores between these two groups was statistically significant, be it on minimum teacher knowledge or pedagogy assessment. However, there were large differences across regions. In particular, teacher scores in the Western and Northern regions were significantly lower. Teachers in Kampala and the Central region scored slightly better than those in the other three regions. Finally, teachers in rural areas fared significantly worse than those in urban areas when it comes to knowledge.

There is a lot of regional and public-private variation in teachers' level of effort. Absence rate among teachers was especially prevalent in the Northern and Eastern regions with more than 33 percent and 26 percent, respectively, of the schools experiencing absence from classroom of close to 70 and 60 percent respectively. As a result, Primary 4 pupils in the Northern region only received 1 hour 52 minutes of teaching time per day out of a 6 hour 56 minute teaching day. At the end of the school year, a pupil in Kampala would have had over three months' worth of education more than a pupil in the North.

When considering the availability of inputs, there is also a great deal of variation between regions as well as the public and private sectors. Perhaps surprisingly, public schools did better than private schools on availability of textbooks. In private schools, virtually none (1.2 percent) had textbooks observed in use by pupils compared to 5.6 percent in public schools—still a very low rate. Public schools did better than private schools on infrastructure, mostly because of the greater privacy, accessibility and cleanliness of toilets. The pupil-teacher ratio was significantly larger in public schools (50:4) compared to private schools (27:3). Looking at location, urban public schools had a slightly larger Primary 4 class size than rural public schools: 57.1 pupils per teacher in urban areas versus 48.4 pupils per teacher in rural areas. Primary 4 teachers in Northern region had classes roughly twice as large as those of their colleagues in the Central region (62:0 vs 32:1).

## How Uganda compares with other countries that have done SDI

Uganda was the second country, after Kenya, to have implemented SDI and was the first fully comparable to another country, Kenya, having used the same instruments. Teachers and pupils were assessed with the exact same questions except for minor changes, particularly to names to contextualize the survey instruments. The same questions were also asked to the heads of schools. Finally, during the analysis, the indicators were computed with the same program, maximizing the comparability between Uganda and Kenya SDI. The instruments used in Tanzania and Senegal, where SDI was piloted, also overlap a great deal with the Uganda and Kenya SDI results, but there are few indicators which are not comparable.

In the area of teacher effort, both *school absence rate* and *classroom absence rate* in Uganda were among the highest, along with Tanzania (2011) and Mozambique (2014).

Uganda also had the highest difference between the *scheduled teaching time* (7hr 13min) and *time spent teaching* (2hr 55min) with 4hr 16min being lost. Uganda was also among the highest performing countries in regards to *minimum knowledge* among teachers, scoring only slightly lower than Tanzania (2014) and 15 percentage points less than Kenya. Teacher test scores were also high with, once again, only Kenya and Tanzania (2014) having higher scores.

When compared to their regional EAC neighbors, teachers in Uganda had weaker mathematics skills than their Kenyan counterparts (Figure C 3). In fact, Ugandan teachers scored lower overall, as well

as in 13 of the 14 mathematical topics covered on the assessment. The largest gaps in knowledge and ability were in comparing fractions, reading a clock, interpreting graphical data, division of fractions, and one-variable algebra problems. Ugandan teachers appeared to be much less prepared to teach their subject matter than their Kenyan counterparts.

For public schools, Uganda's pupil-teacher ratio was amongst the highest (50:1) second only to Tanzania (2011) with a 52:1 ratio. The percentage of pupils with textbooks was the lowest, only 5.6 percent, and significantly lower than any other comparative country. On equipment and infrastructure availability, Ugandan public schools outperformed all other SDI countries.

## Table 1. Uganda SDI At-a-Glance

| | Uganda | Central | Eastern | Kampala | Northern | Western | Public | Private | Urban Public | Rural Public |
|---|---|---|---|---|---|---|---|---|---|---|
| **Teacher Ability** | | | | | | | | | | |
| Minimum knowledge (% teachers) | 19.5 | 24.3 | 22.3 | 18.3 | 14.4 | 15.2 | 19.4 | 19.8 | 25.1 | 16.9 |
| Test Score (out of 100) | 45.3 | 49.2 | 44.6 | 48.4 | 43.4 | 43.0 | 45.5 | 45.0 | 47.3 | 44.6 |
| **Teacher Effort** | | | | | | | | | | |
| School absence rate (% teachers) | 23.3 | 21.7 | 26.0 | 10.7 | 33.6 | 17.7 | 26.6 | 13.4 | 18.4 | 30.2 |
| Classroom absence rate (% teachers) | 52.3 | 46.6 | 60.1 | 37.7 | 69.0 | 41.6 | 56.3 | 39.9 | 49.6 | 59.3 |
| Time spent teaching per day | 3h 17min | 3h 43m | 2h 44m | 4h 43m | 1h 52m | 3h 57m | 2h 55min | 4h 20min | 3h 33min | 2h 44min |
| *Scheduled Teaching Time* | *7h 19min* | *7h20min* | *7h35min* | *7h38min* | *6h56min* | *7h14min* | 7h 13min | 7h 35min | 7h 12min | 7h 14min |
| **Availability of Inputs** | | | | | | | | | | |
| Observed pupil-teacher ratio | 44.6 | 32.1 | 58.6 | 37.3 | 62.0 | 35.3 | 50.4 | 27.3 | 57.1 | 48.4 |
| Textbook availability (% pupils) | 4.5 | 6.8 | 3.9 | 3.4 | 1.1 | 4.5 | 5.6 | 1.2 | 5.9 | 4.0 |
| Minimum equipment availability (% classrooms) | 80.6 | 81.1 | 67.6 | 92.7 | 93.8 | 83.3 | 80.0 | 82.5 | 85.1 | 78.5 |
| Minimum infrastructure availability (% schools) | 53.4 | 49.8 | 50.0 | 67.2 | 65.5 | 52.0 | 38.2 | 58.7 | 66.0 | 56.5 |

## Table 2. SDI At-a-Glance

| Public schools only | Uganda 2013 | Average SDI | Kenya 2012 | Mozambique 2014 | Nigeria[a] 2013 | Senegal 2011 | Tanzania 2014 | Tanzania 2011 | Togo 2013 |
|---|---|---|---|---|---|---|---|---|---|
| **Teacher Ability** | | | | | | | | | |
| Minimum knowledge (% teachers) | 19.4 | **12.7** | 34.8 | 0.3 | 2.4 | Not Comparable | 15.6 | Not Comparable | 0.9 |
| Test score (out of 100) | 45.5 | **42.0** | 55.6 | 26.9 | 30.5 | Not Comparable | 46.6 | Not Comparable | 33.9 |
| **Teacher Effort** | | | | | | | | | |
| School absence rate (% teachers) | 26.6 | **20.1** | 15.2 | 44.8 | 16.9 | 18.0 | 15.3 | 23.0 | 22.6 |
| Classroom absence rate (% teachers) | 56.3 | **42.1** | 47.3 | 56.2 | 22.8 | 29.0 | 46.7 | 53.0 | 39.3 |
| Time spent teaching per day | 2h 55min | **2h 53min** | 2h 30min | 1h 41 min | 3h 10min | 3h 15min | 2h 57min | 2h 04min | 3h 15min |
| *Scheduled teaching time per day* | *7h 13min* | ***5h 31min*** | *5h 31min* | *4h 17min* | *4h 44min* | *4h 36min* | *5h 54min* | *5h 12min* | *5h 28min* |
| **Availability of Inputs** | | | | | | | | | |
| Observed pupil-teacher ratio | 50.4 | **42.1** | 39.3 | 21.4 | 21.5 | 27.2 | 40.6 | 52.0 | 31.4 |
| Textbook availability (% pupils) | 5.6 | **37.2** | 44.5 | 68.1 | 33.7 | 18.0 | 25.9 | 19.7 | 76.0 |
| Minimum equipment availability (% classrooms) | 80.0 | **57.8** | 74.3 | 76.8 | 48.2 | Not Comparable | 62.4 | Not Comparable | 24.3 |
| Minimum infrastructure availability (% schools) | 58.7 | **36.2** | 60.2 | 29.1 | 13.4 | Not Comparable | 36.0 | Not Comparable | 14.4 |
| **Pupil Learning** | | | | | | | | | |
| Language and mathematics test score (out of 100) | 48.4 | **45.4** | 69.4 | 20.8 | 25.1 | Not Comparable | 49.2 | Not Comparable | 38.1 |
| Language test score (out of 100) | 43.4 | **44.8** | 72.5 | 18.7 | 23.3 | Not Comparable | 47.9 | Not Comparable | 36.9 |
| Mathematics test score (out of 100) | 53.4 | **45.2** | 57.4 | 25.1 | 28.2 | Not Comparable | 57.5 | Not Comparable | 41.3 |

Note:
a. Values for Nigeria are the weighted average of the four states surveyed, namely Anambra, Bauchi, Ekiti, and Niger.
b. These numbers reflect the updated SDI methodology. More information on SDI methodology can be found at www.SDIndicators.org.
c. Full definitions of the indicators are found in Annex B.

# I. INTRODUCTION

Between June 20th and August 7th, 2013, 13 education teams travelled throughout Uganda to collect data for the Uganda Service Delivery Indicators (USDI for short). Uganda was the second country to carry out a full-fledged Service Delivery Indicators (SDI) after Kenya. The SDI had been piloted in Senegal and Tanzania in 2010 and is being rolled out across Africa.

The Education USDI has visited a representative sample of primary schools across the country. Following an initial consultation meeting drawing in several stakeholders, the initial SDI instruments have been customized to fit the Ugandan context and it was decided that the USDI would be regionally representative as well. The USDI therefore provides information that allows for comparison of education indicators by (i) region, (ii) location (i.e. urban vs. rural), and (iii) ownership of school (i.e. public vs. private, both for-profit and not-for-profit).

Overall, 400 primary schools have taken part in the survey. The survey, from enumerator training to fieldwork, was implemented by the Economic Policy Research Consortium in close coordination with a World Bank team. In each school, one primary four English or mathematics class was observed. Up to 10 pupils were randomly chosen amongst the primary four learners and a total of 3,966 primary four pupils were assessed for literacy and numeracy skills. Teachers were also assessed with 2,197 of them sitting through a 1 hour 10 minute assessment of their English, mathematics, and pedagogical skills. Finally, 3,803 teachers across grades were tagged and tracked in a second unannounced visit for estimation of teachers' effort level and absence rate in schools.

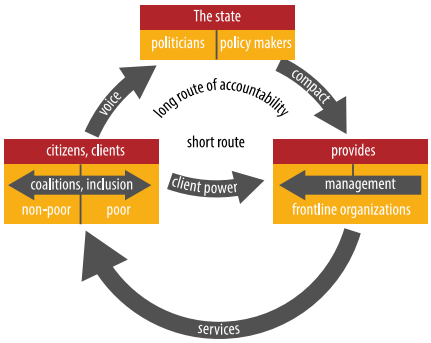
The Education Service Delivery Indicators build on a growing body of literature on measuring the performance of schools and, specifically, teachers. The indicators provide a snapshot of the learning environment and key resources which need to be in place for pupils to learn. As expenditures on teachers represents, by far, the largest share of education spending in developing countries, and, as several recent studies convincingly demonstrate, changes in teacher behavior can improve learning achievement, a strong focus is placed on the knowledge, skills, and effort of teachers.

Annex B presents the Service Delivery Indicators in education and a short definition of each indicator. Below we give some more intuition for the choice of indicators, before presenting the results and a detailed discussion of the findings in the following sections.

## Box 1. Analytical Underpinnings

Service delivery outcomes are determined by the relationships of accountability between policymakers, service providers, and citizens (Figure 1, World Bank 2004). Human development outcomes are the result of the interaction between various actors in the multi-step service delivery system, and depend on the characteristics and behavior of individuals and households. While delivery of quality education is contingent foremost on what happens in classrooms, a combination of several basic elements have to be present in order for quality services to be accessible and produced by teachers at the frontline, which depend on the overall service delivery system and supply chain. Adequate financing, infrastructure, human resources, material, and equipment need to be made available, while the institutions and governance structure provide incentives for the service providers to perform.

### Figure 1. Relationships of accountability between citizens, service providers, and policymakers




**Service Delivery Production Function**

Consider a service delivery production function, *f*, which maps physical inputs, *x*, the effort put in by the service provider, *e*, as well as his/her type (or knowledge), θ, to deliver quality services into individual level outcomes, *y*. The effort variable, *e,* could be thought of as multidimensional and thus include effort (broadly defined) of other actors in the service delivery system. We can think of type as the characteristic (knowledge) of the individuals who are selected for a specific task. Of course, as noted above, outcomes of this production process are not just affected by the service delivery unit, but also by the actions and behaviors of households, which we denote by ε. We can, therefore, write:

$$y = f(x,e,\theta) + \varepsilon$$

To assess the quality of services provided, one should ideally measure $f(x,e,\theta)$. Of course, it is notoriously difficult to measure all the arguments that enter the production, and would involve a huge data collection effort. A more feasible approach is therefore to focus instead on proxies of the arguments which, to a first-order approximation, have the largest effects.

**Indicator Categories and the Selection Criteria**

There are a host of data sets available in education. To a large extent, these data sets measure inputs and outcomes/outputs in the service delivery process, mostly from a household perspective. While providing a wealth of information, existing data sources (like Living Standards Measurement Survey (LSMS), Welfare Monitoring Surveys (WMS), and Core Welfare Indicators Questionnaire Survey (CWIQ)) cover only a sub-sample of countries and are, in many cases, outdated.

## Box 1. Analytical Underpinnings (cont'd)

The proposed choice of indicators takes its starting point from the recent literature on the economics of education and service delivery, more generally. Overall, this literature stresses the importance of provider behavior and competence in the delivery of health and education services (as opposed to water and sanitation services and housing that rely on very different service delivery models). Conditional on service providers exerting effort, there is also some evidence that the provision of physical resources and infrastructure has important effects on the quality of service delivery.

The somewhat weak relationship between resources and outcomes documented in the literature has been associated with deficiencies in the incentive structure of school and education systems. Indeed, most service delivery systems in developing countries present frontline providers with a set of incentives that negate the impact of pure resource-based policies. Therefore, while resources alone appear to have a limited impact on the quality of education and health in developing countries, it is possible inputs are complementary to changes in incentives, so coupling improvements in both may have large and significant impacts (see Hanushek, 2006). As noted by Duflo, Dupas, and Kremer (2011), the fact that budgets have not kept pace with enrollment, leading to large pupil-teacher ratios, overstretched physical infrastructure, and insufficient number of textbooks, etc., is problematic. However, simply increasing the level of resources might not address the quality deficit in education and health without also taking providers' incentives into account.

SDI proposes three sets of indicators: (i) provider effort; (ii) knowledge of service providers and (iii) availability of key infrastructure and inputs at the frontline service provider level. Providing countries with detailed and comparable data on these important dimensions of service delivery is one of the main innovations of the Service Delivery Indicators.

Additional considerations in the selection of indicators are (i) quantitative (to avoid problems of perception biases that limit both cross-country and longitudinal comparisons), (ii) ordinal in nature (to allow within and cross-country comparisons); (iii) robust (in the sense that the methodology used to construct the indicators can be verified and replicated); (iv) actionable; and (v) cost effective to collect.

### Table 3. Education Indicators

| |
|---|
| **Teacher Effort** |
| School absence rate |
| Classroom absence rate |
| Schedule teaching time per day |
| Time spent teaching per day |
| **Teacher Knowledge and Ability** |
| Knowledge in English, |
| Knowledge in mathematics, |
| Knowledge in pedagogy |
| **Availability of Inputs** |
| Infrastructure availability |
| Teaching equipment availability |
| Share of pupils with textbooks |
| Pupils per teacher |

## Box 2. The Service Delivery Indicators (SDI) Program

A significant share of public spending on education is transformed to produce good schooling outcomes at schools. Understanding what takes place at these frontline service provision centers is the starting point in establishing where the relationship between public expenditure and outcomes is weak within the service delivery chain. Knowing whether spending is translating into inputs that teachers have to work with (e.g. textbooks in schools), or how much work effort is exerted by teachers (e.g. how likely are they to come to work), and their competency would reveal the weak links in the service delivery chain. Reliable and complete information on these measures is lacking, in general.

To date, there is no robust, standardized set of indicators to measure the quality of services as experienced by the citizen in Africa. Existing indicators tend to be fragmented and focus either on final outcomes or inputs, rather than on the underlying systems that help generate the outcomes or make use of the inputs. In fact, no set of indicators is available for measuring constraints associated with service delivery and the behavior of frontline providers, both of which have a direct impact on the quality of services that citizens are able to access. Without consistent and accurate information on the quality of services, it is difficult for citizens or politicians (the principal) to assess how service providers (the agent) are performing and to take corrective action.

The SDI provides a set of metrics to benchmark the performance of schools and health clinics in Africa. The Indicators can be used to track progress within and across countries over time, and aim to enhance active monitoring of service delivery to increase public accountability and good governance. Ultimately, the goal of this effort is to help policymakers, citizens, service providers, donors, and other stakeholders enhance the quality of services and improve development outcomes.

The perspective adopted by the Indicators is that of citizens accessing a service. The Indicators can thus be viewed as a service delivery report card on education and health care. However, instead of using citizens' perceptions to assess performance, the Indicators assemble objective and quantitative information from a survey of frontline service delivery units, using modules from the Public Expenditure Tracking Survey (PETS), Quantitative Service Delivery Survey (QSDS), and Staff Absence Survey (SAS).

The literature points to the importance of the functioning of schools and more generally, the quality of service delivery. The service delivery literature is, however, clear that, conditional on providers being appropriately skilled and exerting the necessary effort, increased resource flows for health can indeed have beneficial education outcomes.

The SDI initiative is a partnership of the World Bank, the African Economic Research Consortium (AERC), and the African Development Bank to develop and institutionalize the collection of a set of indicators that would gauge the quality of service delivery within and across countries and over time. The ultimate goal is to sharply increase accountability for service delivery across Africa, by offering important advocacy tools for citizens, governments, and donors alike; to work toward the end goal of achieving rapid improvements in the responsiveness and effectiveness of service delivery.

More information on the SDI survey instruments and data, and more generally on the SDI initiative can be found at: www.SDIndicators.org and www.worldbank.org/SDI, or by contacting SDI@worldbank.org.

A minimum requirement for learning is that the teachers are not absent from the school and spend time in the class rather than somewhere else. The first two indicators — *school absence rate* and *classroom absence rate* — are direct measures of the extent to which this is the case. While having teachers in the class is a necessary condition, however, it is not sufficient for learning to take place. Teachers need to be involved in teaching and they need to have at least a minimum level of knowledge of the subjects they are teaching and skills to transform their knowledge into meaningful

teaching. The indicator *minimum knowledge* measures to what extent these skills exist across schools and the indicator *time spent teaching per day* measures the extent to which teachers are exerting effort to enable learning.

Four of the indicators deal with the environment (i.e., the school). The indicator *minimum equipment availability* assesses if necessary materials such as blackboard, chalk, pencils, and paper are in place to support the teaching activities. The indicator *minimum infrastructure availability* measures whether functioning sanitation facilities exist and if there is at least minimum light in the classroom so that pupils can read and study. Finally, the indicators *observed pupil-teacher ratio* and *share of pupils with textbooks* measure the average number of pupils per teacher in grade four classrooms and the number of mathematics and language books at their disposal.

# II. METHODOLOGY AND IMPLEMENTATION

The sample of the Uganda SDI is given in Table 4. Overall, 400 primary schools were visited; 2,197 primary three, four, and five teachers were assessed on English, mathematics, and pedagogy; 3,806 teachers of all grades were followed for absence rate (not shown in Table 4). Also, although learning outcomes were not part of the indicators, 3,966 primary four pupils were assessed on English, mathematics, and non-verbal reasoning. It was crucial that the indicators be correlated with pupil learning outcomes because the SDI was geared towards capturing the drivers of learning outcomes at the school level.

**Table 4. Uganda's Education SDI Sample**

| | Schools | | | | Teachers | | | Primary 4 Pupils | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (1) | (2) | (3) |
| **Total Sample** | **400** | | | | **2,197** | | | **3,966** | | |
| **Ownership** | | | | | | | | | | |
| Public | 319 | 79.8 | 74.5 | 71.1 | 1,781 | 81.1 | 74.8 | 3,181 | 80.2 | 86.7 |
| Private | 81 | 20.2 | 25.6 | 28.9 | 416 | 18.9 | 25.2 | 785 | 19.8 | 13.3 |
| *Not-for-profit* | *21* | *5.2* | *7.3* | | *106* | *4.8* | *6.6* | *188* | *4.8* | *3.0* |
| *For-profit* | *60* | *15.0* | *18.2* | | *310* | *14.1* | *18.6* | *597* | *15.0* | *10.3* |
| **Region** | | | | | | | | | | |
| Central | 95 | 23.7 | 26.6 | 26.6 | 489 | 22.3 | 26.3 | 942 | 23.7 | 18.3 |
| Eastern | 95 | 23.7 | 25.3 | 25.3 | 530 | 24.1 | 27.4 | 950 | 24.0 | 37.2 |
| Kampala | 45 | 11.3 | 2.9 | 2.9 | 253 | 11.5 | 4.0 | 449 | 11.3 | 2.5 |
| Northern | 60 | 15.0 | 15.5 | 15.5 | 381 | 17.3 | 16.7 | 600 | 15.1 | 21.1 |
| Western | 105 | 26.3 | 29.7 | 29.7 | 544 | 24.8 | 25.6 | 1,025 | 25.9 | 20.9 |
| **Location** | | | | | | | | | | |
| Rural | 282 | 70.5 | 73.8 | 77.7 | 1,498 | 68.2 | | 2,792 | 70.4 | 68.8 |
| Urban | 118 | 29.5 | 26.2 | 22.3 | 699 | 31.8 | | 1,174 | 29.6 | 31.2 |

Notes: Each unit of analysis i.e. schools, teachers, or pupils has its own specific weights which are where relevant. Columns' definitions are as follows: (1) is sample size; (2) is share of sample; (3) is the weighted share; (4) is the distribution in the actual sample frame or universe.

The Uganda SDI was representative at the level of five regions: Central, Eastern, Kampala, Northern, and Western. It was also representative of school ownership type (i.e. public or private), as well as location (i.e. urban/rural). Annex A of this report explains the sampling strategy in detail. It is noteworthy that each entity has its own weight. Weights for schools were, therefore, different from weights for pupils or teachers. The latter weights even differed for the analysis of absence rate and the knowledge content analysis. The difference in weights came from the fact that for each unit of analysis a sample needed to be drawn.

### Survey Instruments and Survey Implementation

The survey used a sector-specific questionnaire (Table 5) with all modules administered at the school level. The questionnaires were built on previous similar questionnaires based on international good practice for PETS, QSDS, SAS, and other observational surveys.

## Table 5. Education SDI survey instrument

| Module | Description |
|---|---|
| **Module 1**: School Information | Administered to the head of the school to collect information about school type, facilities, school governance, pupil numbers and school hours. Includes direct observations of school infrastructure by enumerators. |
| **Module 2a**: Teacher Absence & Info | Administered to head teacher and individual teachers to obtain a list of all school teachers, to measure teacher absence and to collect information about teacher characteristics. |
| **Module 2b**: Teacher Absence & Info | Unannounced visit to the school to assess absence rate. |
| **Module 3**: School Finances | Administered to the head teacher to collect information about school finances. |
| **Module 4**: Classroom Observation | An observation module to assess teaching activities and classroom conditions. |
| **Module 5**: Pupil Assessment | A test of pupils to have a measure of pupil learning outcomes in mathematics and language in grade four. |
| **Module 6**: Teacher Assessment | A test of teachers covering mathematics and language subject knowledge and teaching skills. |

# III. RESULTS

## A. Teacher effort

There were four indicators designed to capture the effort teachers put into their job and their level of knowledge. These indicators were (i) *school absence rate*, (ii) *classroom absence rate*, (iii) *minimum knowledge*, and (iv) *time spent teaching per day.* The rationale behind these indicators was that the low levels of accountability and weakened incentives observed in many countries, especially in sub-Saharan Africa, have led to an upsurge in the absence rate for teachers. A classroom with no teacher is an environment where no learning is taking place. The indicators were computed to show regional differences, differences between public and private schools, as well as, rural and urban schools (Table 6).

**Table 6. Teacher effort**

| Percent | All | Public | Private | Percent Difference (%) | Urban Public | Rural Public | Percent Difference (%) |
|---|---|---|---|---|---|---|---|
| School absence rate (% teachers) | 23.3 | 26.6 | 13.4 | 98.5*** | 18.4 | 30.2 | -39.1*** |
| Classroom absence rate (% teachers) | 52.3 | 56.3 | 39.9 | 41.1*** | 49.6 | 59.3 | -16.4** |
| Time spent teaching per day | 3h 17min | 2h 55min | 4h 20 min | -32.7*** | 3h 33min | 2h 44min | 29.9* |
| *Scheduled teaching time per day*[1] | *7h 19min* | *7h 13min* | *7h 35min* | *-4.8**** | *7h 12min* | *7h 14min* | *1.8* |

Note: Level of significance: *** p < 0.01; ** p < 0.05; * p < 0.1.

*School absence rate*

**Methodological Note**

*School absence rate* is measured as the share of teachers who are absent from school at the time of an unannounced visit. It is measured in the following way: During the first announced visit, a maximum of ten teachers are randomly selected from the list of all teachers (excludes volunteer and part time teachers) who are on the school roster. The whereabouts of these ten teachers are then verified in the second, unannounced, visit. Teachers found anywhere on the school premises are marked as present.

As shown in Table 6 and Table 7, absence from school was an important phenomenon in Uganda with around one out of four teachers not on the school premises at the time of the visit.[2] Teachers in the public sector were almost twice as likely to be absent from school than private school teachers. Rural public teachers were significantly more likely to be absent from school than their urban public school colleagues. This may seem at first surprising given the fact that one would expect urban teachers to

[1] *Scheduled teaching time per day* is not an SDI indicator; it is reported in the table for comparison purposes.
[2] The majority of the surprise visits took place during the morning with roughly 70 percent of the enumerators arriving before 12pm (the mode of arrival is between 9-10 am). The surprise visit lasted 45 minutes on average. As one would expect, absence rate increases gradually throughout the school day.

have access to many more outside opportunities than their rural counterparts and, therefore, would have higher absence rates in urban areas.

*Classroom absence rate*

**Methodological Note**

*Classroom absence rate* is measured as the share of teachers not in the classroom at the time of an unannounced visit. The indicator is constructed in the same way as the school absence rate indicator, with the exception that the numerator now is the number of teachers who are either absent from school, or present at school but absent from the classroom.

Even when in school, teachers were not necessarily in the classroom teaching. To capture this new dimension, the indicator *classroom absence rate* was used.

More than one-third (39.1 percent) of the teachers found in school were not in the classroom teaching. This brought the classroom absence rate to 52.3 percent nationally. This simply means that at any point in time, more than half of Ugandan primary teachers were outside the classroom and not teaching. This constituted an enormous waste of time and resources. The classroom absence rate in public schools was 41.1 percent higher than that in private schools and public school teachers were 16.4 percentage points more likely to be absent from class than teachers in the private sector (Table 6).

**Table 7. School absence rate and Classroom absence rate**

| | School absence rate | | | | Classroom absence rate | | | |
|---|---|---|---|---|---|---|---|---|
| | Percent (%) | Robust Std. Err. | [95% Conf. Interval] | | Percent (%) | Robust Std. Err. | [95% Conf. Interval] | |
| **Uganda** | 23.3 | 0.014 | 0.205 | 0.261 | 52.3 | 0.016 | 0.492 | 0.554 |
| **Central** | 21.7 | 0.025 | 0.168 | 0.266 | 46.6 | 0.030 | 0.407 | 0.526 |
| **Eastern** | 26.1 | 0.029 | 0.203 | 0.318 | 60.1 | 0.028 | 0.546 | 0.656 |
| **Kampala** | 10.7 | 0.021 | 0.065 | 0.149 | 37.7 | 0.043 | 0.293 | 0.462 |
| **Northern** | 33.6 | 0.040 | 0.257 | 0.415 | 69.0 | 0.024 | 0.642 | 0.738 |
| **Western** | 17.7 | 0.024 | 0.131 | 0.224 | 41.6 | 0.029 | 0.359 | 0.474 |
| **Public** | 26.6 | 0.016 | 0.234 | 0.298 | 56.3 | 0.016 | 0.531 | 0.595 |
| **Private** | 13.4 | 0.025 | 0.084 | 0.183 | 39.9 | 0.034 | 0.332 | 0.465 |
| **Urban** | 15.6 | 0.024 | 0.108 | 0.205 | 45.4 | 0.029 | 0.397 | 0.512 |
| **Rural** | 27.1 | 0.016 | 0.239 | 0.303 | 55.6 | 0.018 | 0.520 | 0.592 |

There were important regional variations in absence rates as shown in Figure 2 and Table 7. The highest school and classroom absence rates were observed in the Eastern and Northern regions with respectively 26 percent and 34 percent of teachers nowhere to be found in the school. The classroom absence rate in those two regions was alarmingly high with six out of 10 teachers in the Eastern region

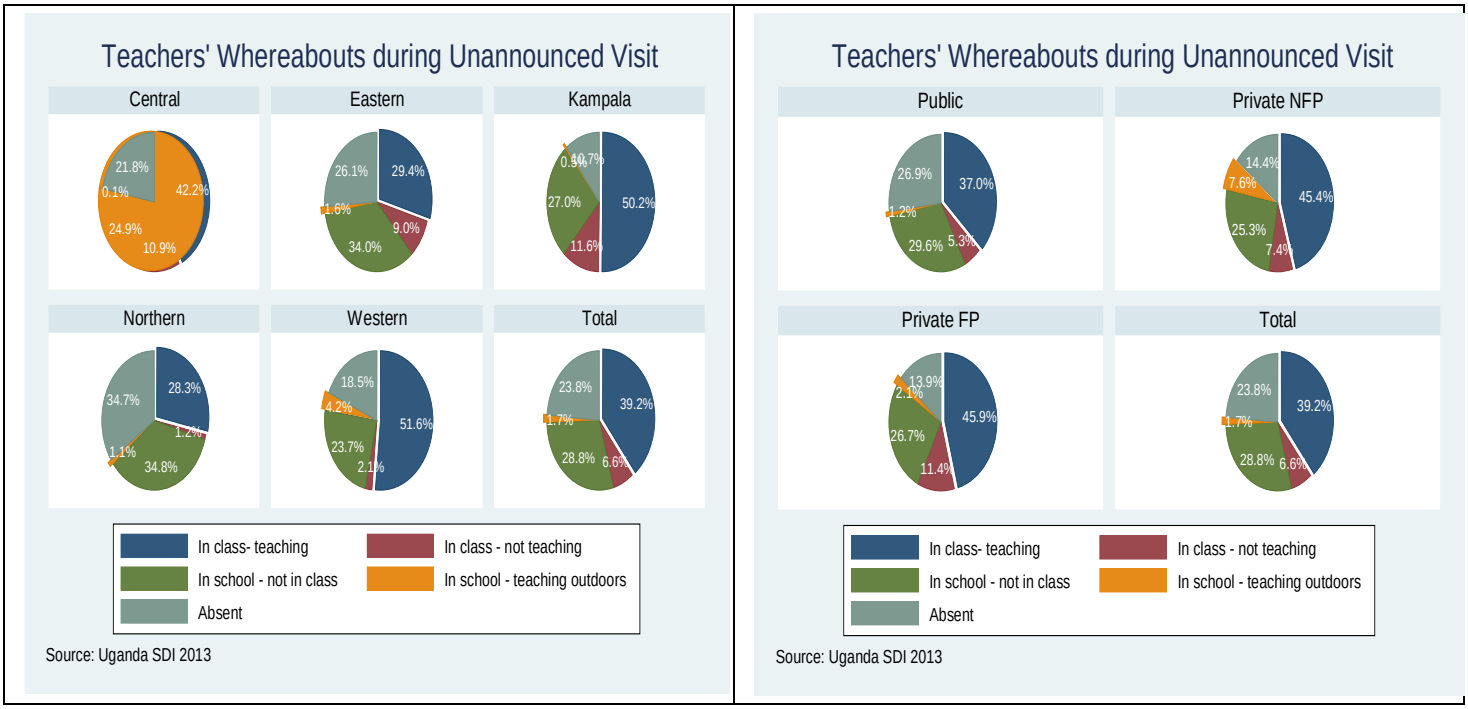
not in class. In the North for every 10 teachers in primary schools, only three were in classroom working with pupils. Figure C 1 graphically displays the absence rates within the regions. Looking at the "quartile" distribution of absence rate (Table 8), more than 70 percent of Northern schools had classroom absence rates above 60 percent. Furthermore, only 2.8 percent of the schools had a school absence rate lower than 40 percent. The Eastern region showed similar but less intense absence rate patterns than the north. Kampala registered the lowest absence rate with "only" 10 percent absence from school although classroom absence was fairly high at 37.7 percent. Graphical representations of the "quartiles" of absence rates are also shown in Figure C 1.

**Table 8. "Quartiles" of absence rates**

| | "Quartiles" of School absence rate | | | | "Quartiles" of Classroom absence rate | | | |
|---|---|---|---|---|---|---|---|---|
| | *20% or less* | *20 to 40%* | *40 to 60%* | *60+% absent* | *20% or less* | *20 to 40%* | *40 to 60%* | *60+% absent* |
| **Uganda** | 46.1 | 29.3 | 16.5 | 8.1 | 7.9 | 18.2 | 30.1 | 43.8 |
| **Central** | 53.0 | 22.5 | 17.2 | 7.3 | 10.5 | 21.7 | 37.0 | 30.8 |
| **Eastern** | 38.4 | 30.2 | 21.2 | 10.3 | 0.0 | 12.4 | 27.6 | 60.1 |
| **Kampala** | 75.2 | 16.9 | 7.9 | 0.0 | 22.2 | 30.4 | 20.2 | 27.2 |
| **Northern** | 24.5 | 39.1 | 21.8 | 14.6 | 0.0 | 2.8 | 23.1 | 74.1 |
| **Western** | 56.6 | 31.2 | 8.5 | 3.7 | 16.8 | 29.0 | 31.9 | 22.3 |
| **Rural** | 37.7 | 32.8 | 18.1 | 11.4 | 6.7 | 14.3 | 30.2 | 48.8 |
| **Urban** | 62.6 | 22.5 | 13.3 | 1.6 | 10.3 | 25.7 | 30.1 | 34.0 |
| **Public** | 37.0 | 34.0 | 19.9 | 9.2 | 5.4 | 14.8 | 29.2 | 50.6 |
| **Private** | 74.2 | 14.8 | 6.2 | 4.8 | 15.7 | 28.6 | 33.1 | 22.7 |

Where were the teachers at the time of the unannounced visit? Figure 2 provides the answer to that question by region and by type of school. Although class absence rate was at 52.3 percent, only 40.9 percent of the teachers were actually teaching (of which 1.7 percent were outdoors). Indeed, 6.6 percent (a non-negligible share) of teachers were in class but were attending other matters rather than teaching. The Western region had the highest proportion of teachers actually teaching with 55.8 percent of the teachers instructing pupils, followed by Kampala with about half the teachers teaching. Kampala also displayed the largest share (11.6 percent) of teachers in class but not teaching, followed by Central with 10.9 percent of teachers doing the same. Actual teaching barely happened in the Northern region with less than 30 percent of teachers teaching. This was also true of the Eastern region with only 31.0 percent of teachers teaching. Note also that teaching activity occupied less than two teachers out of 5 in public schools.

**Figure 2. Teachers' whereabouts during unannounced visit**




Finally, Table 9 showed absence rate as related to a few select teacher characteristics such as gender, place of birth, and position in the school. Male teachers were more likely to be absent from school than their female counterparts, but the difference was not statistically significant. However, male teachers were also 15 percentage points more likely not to be in class and this difference was strongly significant. Teachers who were born in the district where they taught were significantly more likely not to show up in school, and not to be in the classroom when they came to school. As expected, head teachers were much more likely not to be in class because they may have had other administrative duties to cater to. However, head teachers were also significantly more likely to be absent from the schools they managed than regular teachers.

**Table 9. School and Classroom absence rates by gender and birth place**

| | School absence rate | | | | Classroom absence rate | | | |
|---|---|---|---|---|---|---|---|---|
| | Percent (%) | Robust Std. Err. | [95% Conf. Interval] | | Percent (%) | Robust Std. Err. | [95% Conf. Interval] | |
| **Uganda** | 23.3 | 0.014 | 0.205 | 0.261 | 52.3 | 0.016 | 0.492 | 0.554 |
| **Male** | 25.9 | 0.018 | 0.224 | 0.294 | 58.5 | 0.018 | 0.550 | 0.619 |
| **Female** | 19.9 | 0.017 | 0.166 | 0.232 | 43.9 | 0.020 | 0.401 | 0.478 |
| **Head teacher** | 37.3 | 0.038 | 0.298 | 0.449 | 84.2 | 0.026 | 0.791 | 0.893 |
| **Other teacher** | 22.2 | 0.014 | 0.193 | 0.250 | 49.7 | 0.017 | 0.464 | 0.530 |
| **Born in District** | 26.4 | 0.019 | 0.227 | 0.301 | 55.2 | 0.020 | 0.512 | 0.591 |
| **Not born in district** | 18.3 | 0.017 | 0.150 | 0.217 | 47.7 | 0.021 | 0.434 | 0.519 |

*Time spent teaching per day*

**Methodological Note**

*Time spent teaching per day* reflects the typical time that teachers spend teaching on an average day. This indicator combines data from the staff roster module (used to measure absence rate), the classroom observation module, and reported teaching hours. The teaching time is adjusted for the time teachers are absent from the classroom, on average, and for the time the teacher teaches while in classroom based on classroom observations. While inside the classroom distinction is made between teaching and non-teaching activities.

Teaching is defined very broadly, including actively interacting with pupils, correcting or grading pupil's work, asking questions, testing, using the blackboard or having pupils working on a specific task, drilling or memorization. Non-teaching activities include working on private matters, maintaining discipline in class or doing nothing and thus leaving pupils not paying attention.

This indicator measures the amount of time a teacher spent teaching in a school during a normal day, which on average was 3 hours and 17 minutes in Uganda (Table 6). That is, teachers only taught about half of the scheduled time (7 hours and 19 minutes accounting for break times). Several intermediate inputs fed into the calculation of this indicator, which are discussed in the following paragraphs.

First, we began by recording the scheduled time of a teaching day from school records (i.e., 7 hours 19 minutes). Then we multiplied this number by the proportion of teachers absent from classroom. The idea being that if 10 teachers were supposed to teach 7 hours and 19 minutes per day, but five of them were absent from either the school or the class at any one time, then scheduled teaching time was reduced to 3 hours and 26 minutes (7 hours and 19 minutes x 0.47).

Even when in the class, however, teachers were not necessarily teaching. The percentage of the lesson lost to non-teaching activities was measured through observation of a grade four lesson.[3] Based on the SDI data, roughly 6.2 percent of a typical lesson was lost due to non-teaching activities.[4] Note that this number was also fairly close to the 6.6 percent of teachers found in class but not teaching as shown in Figure 2.

To take account of this, we multiplied our measure by the proportion of a typical lesson that was spent on teaching, which, therefore, further reduced the teaching time to 3 hours and 17 minutes. This revealed a large difference of 1 hour and 25 minutes in actual teaching time between public and private schools despite a rather small difference (17 minutes) in scheduled teaching time (Table 6). The regional differences were also stark with pupils in the Northern region receiving less than two hours of teaching per day compared to Kampala's pupils who had 4 hours and 43 minutes of contact time with their teacher every school day.

[3] During the observation, enumerators first had to judge whether the teacher was teaching or not. If they judged the teacher to be teaching, they were supposed to indicate how much time the teacher spent on any of the following teaching activities: teacher interacted with all pupils as a group; teacher interacted with small group of pupils; teacher interacted with pupils one-on-one; teacher read or lectured to the pupils; teacher supervised pupil(s) writing on the board; teacher led kinesthetic group learning activity; teacher was writing on blackboard; teacher was listening to pupils recite/read; teacher was waiting for pupils to complete task; teacher was testing pupils in class; teacher was maintaining discipline in class; teacher was doing paperwork.

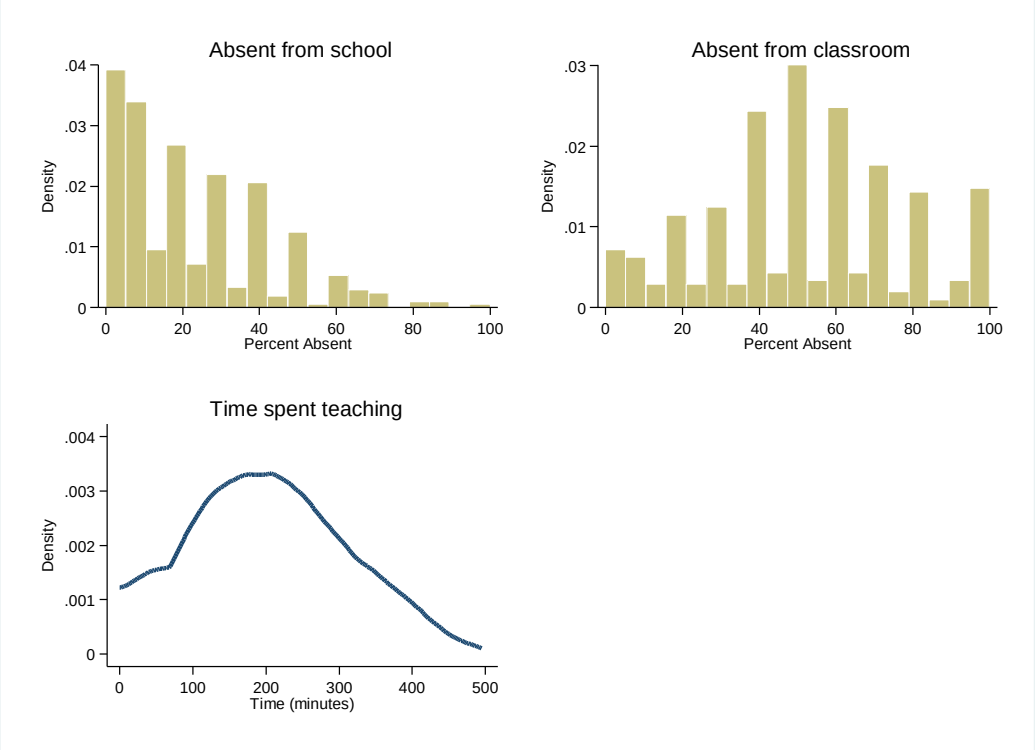
[4] This was most likely an upper bound on the time devoted to teaching during a lesson, since presumably a teacher was more likely to teach when under direct observation (i.e. Hawthorne effects will bias the estimate upward).

Table 10 and Figure C 2 also provide information on a complementary measure of effort – the share of classrooms with pupils but no teacher; i.e. orphaned classrooms. This was measured by inspecting the school premises, counting the number of classrooms with pupils and recording whether a teacher was present in the classroom or not. The share of orphaned classrooms was then calculated by dividing the number of classrooms with pupils but no teacher by the total number of classrooms that contained pupils. In total, 36.7 percent of classrooms were orphaned (41.5 percent in public vs. 24.6 percent in private schools).

**Table 10. Orphan classrooms (No teacher but pupils are present)**

| | Total # Classrooms | # Classrooms with Pupils | # Orphan Classrooms | Percent (%) | Std. Err. | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|---|
| | | | | *Share Orphan Classrooms* | | | |
| **Uganda** | 8.5 | 6.9 | 2.5 | 36.7 | 0.022 | 0.324 | 0.411 |
| **Central** | 8.7 | 7.4 | 1.8 | 24.0 | 0.032 | 0.177 | 0.303 |
| **Eastern** | 8.9 | 7.2 | 2.8 | 39.4 | 0.038 | 0.319 | 0.468 |
| **Kampala** | 10.8 | 9.0 | 2.8 | 30.6 | 0.063 | 0.181 | 0.431 |
| **Northern** | 7.5 | 5.8 | 2.5 | 43.4 | 0.034 | 0.366 | 0.501 |
| **Western** | 8.5 | 6.7 | 3.0 | 44.7 | 0.054 | 0.341 | 0.553 |
| **Public** | 8.4 | 6.7 | 2.8 | 41.5 | 0.023 | 0.370 | 0.460 |
| **Private** | 8.8 | 7.7 | 1.9 | 24.6 | 0.050 | 0.148 | 0.343 |
| **Urban** | 10.4 | 8.3 | 2.8 | 33.9 | 0.049 | 0.243 | 0.434 |
| **Rural** | 7.9 | 6.4 | 2.4 | 38.0 | 0.023 | 0.335 | 0.426 |

**Figure 3. Distribution of teacher effort[5]**




## B. Teacher competence

*Minimum knowledge*

**Methodological Note**

*Minimum knowledge* is measured as the percentage of teachers who can master the curriculum they taught. It is based on mathematics and language tests covering the primary curriculum administered at the school level and is calculated as the percentage of teachers who score more than 80% on the language and mathematics portion of the test. The test is given to all mathematics or language teachers that taught 3rd grade last year or 4th grade in the year the survey was conducted.

The share of teachers with minimum content knowledge was calculated on the basis of a custom-designed teacher test administered to the grade four mathematics and English teachers of the 2011 and 2012 cohorts.

[5] Definition of "density": In probability theory, a probability density function (PDF), or density of a continuous random variable, is a function that describes the relative likelihood for this random variable to take on a given value. The probability of the random variable falling within a particular range of values is given by the integral of this variable's density over that range—that is, it is given by the area under the density function but above the horizontal axis and between the lowest and greatest values of the range. The probability density function is nonnegative everywhere, and its integral over the entire space is equal to one."(http://en.wikipedia.org/wiki/Probability_density_function).

The objective of the teacher test was two-fold: to examine whether teachers had the basic reading, writing, and arithmetic skills that lower primary pupils need to have in order to progress further with their education. This was interpreted as the *minimum* knowledge required for the teacher to be effective and is the basis for the *minimum knowledge* indicator.

In addition, the test also examined the extent to which Ugandan teachers demonstrated mastery of subject content skills that were above the level at which they were teaching and mastery of pedagogic skills. Out of courtesy to teachers, the test was designed as a marking exercise, in which teachers had to mark and correct a hypothetical pupil's exam. The English test was administered to teachers teaching English, or English and other subjects, and the mathematics test was administered to teachers teaching mathematics, or mathematics and other subjects. The test was validated against the Ugandan primary curriculum, as well as 12 other Sub-Saharan curricula.[6]

**Box 3. Assessment of knowledge of teachers**

Teachers were assessed for their mastery of the primary school level mathematics and English curriculum on one hand and teaching skills on the other. To test for teacher knowledge in mathematics and English, teachers were given an indirect test. The test involved asking teachers to mark standardized tasks done by a pupil and suggest a correct answer whenever they indicated the pupil gave the wrong answer. Thus they were assessed on their ability to identify and suggest a correct answer. The pupil tasks that teachers were asked to mark covered various topics, giving a complete picture of the assessed teachers' mastery of the curriculum.

The test for teaching skills asked teachers to perform tasks they are expected to do to enhance pupil learning such as preparing a lesson plan, evaluating pupils, and tracking progress in pupil performance. For example, teachers were presented with a short story about accidents and asked to prepare a lesson on the reasons road accidents happen and the consequences. Among other things, they were then asked to i) specify the learning objectives of the lesson; ii) suggest questions they would ask to determine that pupils understood the lesson and can apply what they have learnt; and iii) write points of arguments for group activities. To test their ability to compare and evaluate pupil performance, teachers were presented with compositions written by two pupils and asked to identify the strengths and weaknesses of each pupil.

Content knowledge among Ugandan teachers was extremely low. As a matter of fact, only 19.5 percent of teachers scored more than 80 percent on the test (Table 11). Private schools' teachers were at similar level to their counterparts in public schools. Although urban public teachers scored 8.2 percentage points higher than rural public teachers, they were significantly more likely to be above the minimum knowledge threshold. Overall, all displayed equally disappointing levels of content knowledge. There was, however, some regional variation with teachers in the Western and Northern regions faring worse, compared to those in the Central and Eastern regions. Kampala teachers seemed to be somewhat in the middle on minimum knowledge.

Table 11 and Table 12 detail the average score on the test and show the sensitivity of the minimum knowledge indicator to different cut-offs (i.e., requiring a score of 100 percent, 90 percent, and 70 percent). The results appeared fairly sensitive to the choice of threshold, with only 5.5 percent of

[6] See "Teaching Standards and Curriculum Review", prepared as background document for the SDI by David Johnson, Andrew Cunningham and Rachel Dowling.

the teachers viewed as having minimum knowledge when this indicator was calculated as the percentage of teachers who scored more than 90 percent on the lower primary part of the English and mathematics test. When the indicator was calculated at 70 percent, 36.3 percent of the teachers were viewed as having minimum knowledge. The average score on both sections of the test (including lower and upper primary material) was 42.7 percent.

Table C 1 sheds further light on why minimum knowledge was so low. In particular, the low scores on the English section -- only three percent of teachers were above the 80 percent cut-off -- accounted for the overall low scores. Although mathematics teachers fared better, only 25 percent were above the 80 percent cut-off.

**Table 11. Teachers' test scores by region**

| Percent | Uganda | Central | Eastern | Kampala | Northern | Western |
|---|---|---|---|---|---|---|
| **Minimum knowledge (% teachers)** | **19.5** | **24.3** | **22.3** | **18.3** | **14.4** | **15.2** |
| Minimum knowledge: 100% | 1.8 | 2.0 | 2.8 | 0.9 | 1.3 | 1.1 |
| Minimum knowledge: 90% | 5.2 | 6.1 | 6.5 | 5.5 | 6.1 | 2.5 |
| Minimum knowledge[a]: 70% | 35.8 | 44.2 | 37.2 | 41.6 | 28.7 | 29.4 |
| **English and mathematics test score (out of 100)** | **63.2** | **67.6** | **64.1** | **66.6** | **58.9** | **60.2** |
| English test score (out of 100) | 58.2 | 61.6 | 58.9 | 61.4 | 55.0 | 55.4 |
| Mathematics test score (out of 100) | 64.6 | 70.1 | 66.0 | 69.2 | 58.1 | 60.9 |

Note: Weighted means using sampling weight. Results based on observations from 2168 teachers in 306 schools (1,205 teachers who either teach English or both English and mathematics, and 1,290 teachers who teach either mathematics or both English and mathematics).

**Table 12. Teachers' test scores by type of school and location**

| Percent | Uganda | Public | Private | Percent Difference (%) | Urban Public | Rural Public | Percent Difference (%) |
|---|---|---|---|---|---|---|---|
| **Minimum knowledge (% teachers)** | 19.5 | 19.4 | 19.8 | -2.0 | 25.1 | 16.9 | 48.5** |
| Minimum knowledge: 100% | 1.8 | 1.9 | 1.5 | 26.7 | 2.6 | 1.6 | 62.5 |
| Minimum knowledge: 90% | 5.2 | 5.1 | 5.7 | 10.5 | 6.1 | 4.6 | 32.6 |
| Minimum knowledge: 70% | 35.8 | 34.9 | 38.4 | 9.1 | 41.3 | 32.1 | 28.3* |
| **English and mathematics test score (out of 100)** | 63.2 | 62.9 | 64.2 | -2.0 | 66.2 | 61.4 | 7.8 |
| English test score (out of 100) | 58.2 | 58.4 | 57.7 | 1.2 | 62.0 | 56.9 | 9.0*** |
| Mathematics test score (out of 100) | 64.6 | 63.8 | 66.9 | -4.6 | 68.4 | 61.9 | 10.5*** |

Note: Statistically significant difference between public/private; rural/urban schools at 1% (***), 5% (**) or 10% (*). Weighted means using sampling weight. Results based on observations from 2168 teachers in 306 schools (1,205 teachers who either teach English or both English and mathematics, and 1,290 teachers who teach either mathematics or both English and mathematics).

## C. Test scores

**Methodological Note**

Test score is measured as the overall score of a language, mathematics and pedagogy tests covering the primary curriculum administered at the school level to all mathematics and language teachers that taught 3rd grade last year or 4th grade in the year the survey was conducted.

Figure 5Figure 5 graphs the distributions of the test scores. There was wide variation, and one can see that pedagogical knowledge was especially low among teachers with the average score, collapsed at the school level, standing at 23.3 percent. A detailed breakdown of the teacher assessment by section is offered in Table C 2.

*English*

Table 13 presents the average score on the English section of the test, as well as a detailed analysis of particular questions. The average score on the English section was 58.2 percent indicating that teachers only mastered slightly more than half of the lower primary curriculum. Nevertheless, this gives a slightly more positive picture than the *minimum knowledge* indicator (the share of teachers scoring above 80 percent on the English test), which measured 3.7 percent overall (Table C 1).

Teachers scored an average close to 90 percent on the grammar assessment, which asked them to complete sentences with the correct conjunction, verb, or preposition. Despite the high scores, there were some gaps. For example, 25 percent of teachers were not able to correct the sentence "If you tidy up your room, you won't get candy", even though the correct alternative ("Unless") was given (recall that teachers were asked to mark a hypothetical pupil's exam).

Scores on the Cloze exercise[7], which assessed vocabulary and text comprehension, were somewhat lower (62 percent). Again, some weaknesses emerged. While teachers were able to confirm that pupils had answered correctly, they struggled to correct wrong answers or complete sentences that the pupil had left blank. For example, 55 percent of teachers could not correct the sentence "I want not go to school."

Teachers recorded their worst performance on the composition exercise with an average score of only 43.2 percent. They were tasked to correct a letter for grammar, punctuation, spelling, syntax, and salutation. Overall, the text to be corrected contained 24 mistakes and the teachers on average caught and corrected fewer than half of them.

Public school teachers' performance was on par with that of teachers in the private sector for all the subsections of the English test. The same held when comparing urban and rural teachers in the public sector. Regional differences on the English test were not very stark, as well. Teachers in the Northern and Western regions seemed to perform consistently below average but still not very far from that average.

[7] This exercise consisted of a short story with blanks where certain words were removed, which the teachers had to complete in a meaningful way.

**Table 13. Teacher English assessment**

| Percent | Uganda | Central | Eastern | Kampala | Northern | Western | Public | Private | Urban Public | Rural Public |
|---|---|---|---|---|---|---|---|---|---|---|
| **English section (complete)** | **58.2** | **61.6** | **58.9** | **61.4** | **55.0** | **55.4** | **58.4** | **57.7** | **62.0** | **56.9** |
| Grammar task | 90.0 | 92.2 | 89.6 | 89.9 | 87.5 | 89.6 | 90.0 | 90.0 | 91.5 | 88.2 |
| Cloze task | 62.0 | 64.9 | 62.1 | 66.9 | 63.3 | 57.6 | 60.9 | 65.2 | 60.2 | 58.4 |
| Composition | 43.2 | 47.3 | 44.7 | 47.0 | 37.6 | 40.2 | 44.0 | 40.8 | 42.8 | 37.7 |

*Mathematics*

Table 14 presents the average score on the mathematics section of the test (64.6 percent), as well as a detailed analysis of particular questions. The difference between scores on the lower and upper primary curriculum was small. Again, private school teachers and public school teachers recorded similar average performances. Teachers in Western and Northern regions performed significantly worse than teachers in other regions. Teachers in rural schools performed on average below teachers in urban schools, especially on questions in the upper primary part of the assessment.

Looking at the details of the test, 17.1 percent of the teachers could not subtract two-digit numbers, 23.8 percent of teachers could not multiply two-digit numbers, and close to 40 percent of the teachers could not add or subtract numbers with decimals. Furthermore, almost half (44.9 percent) of teachers could not solve a one variable equation, more half of the teachers (57.9 percent) could not perform division with fractions and almost seven out of ten (68.4 percent) could not interpret data on a graph, which were upper primary level but should be mastered by all teachers. Mirroring the English assessment's results, Uganda's primary teachers' content knowledge in mathematics was very low. Table C 3 offers a complete breakdown of the mathematics section of the teacher assessment.

## Table 14. Teachers' mathematics assessment

| Percent | Uganda | Central | Eastern | Kampala | Northern | Western | Public | Private | Urban Public | Rural Public |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mathematics section (complete)** | **64.6** | **70.1** | **66.0** | **69.2** | **58.1** | **60.9** | **63.8** | **66.9** | **68.4** | **61.9** |
| Adding two-digit numbers | 96.9 | 99.0 | 95.5 | 97.7 | 97.0 | 95.7 | 97.1 | 96.1 | 97.5 | 97.0 |
| Subtracting two-digit numbers | 82.9 | 86.2 | 83.4 | 81.1 | 84.2 | 78.2 | 81.9 | 85.7 | 84.3 | 81.0 |
| Adding three-digit numbers | 86.8 | 92.0 | 86.3 | 89.0 | 78.8 | 87.1 | 85.2 | 91.9 | 85.0 | 85.4 |
| Multiplying two-digit numbers | 76.2 | 75.8 | 81.6 | 83.0 | 69.4 | 74.9 | 75.7 | 77.8 | 81.2 | 73.5 |
| Adding decimals | 60.7 | 63.4 | 58.2 | 64.9 | 55.0 | 63.5 | 60.6 | 61.1 | 65.5 | 58.6 |
| Comparing fractions | 81.6 | 89.4 | 80.6 | 87.8 | 77.6 | 76.0 | 81.0 | 83.3 | 83.7 | 79.9 |
| Time (reading a clock) | 44.2 | 54.5 | 43.1 | 58.8 | 38.5 | 36.1 | 45.7 | 39.5 | 44.2 | 46.3 |
| Interpreting a Venn diagram | 72.1 | 76.5 | 75.8 | 79.3 | 65.4 | 67.0 | 72.0 | 72.3 | 78.0 | 69.5 |
| Interpreting data on a graph | 31.6 | 36.5 | 35.4 | 33.0 | 26.0 | 26.0 | 31.9 | 30.6 | 34.3 | 30.9 |
| Square root (no remainder) | 80.4 | 86.5 | 80.4 | 86.0 | 68.3 | 81.4 | 78.0 | 88.0 | 83.7 | 75.7 |
| Subtracting decimals | 68.1 | 73.7 | 69.0 | 74.5 | 59.0 | 66.4 | 65.3 | 76.8 | 75.9 | 60.9 |
| Division of fractions | 42.1 | 52.8 | 42.0 | 36.4 | 44.3 | 30.5 | 39.9 | 49.2 | 41.2 | 39.4 |
| One variable algebra | 55.1 | 66.0 | 57.3 | 71.8 | 43.6 | 46.7 | 52.8 | 62.6 | 58.8 | 50.3 |

*Pedagogy*

The pedagogical test was comprised of three sections aiming at assessing teachers' skills in (i) preparing a lesson plan, (ii) evaluating pupils, and (iii) tracking progress in pupil performance. The overall score on the pedagogy section was 25.5 (Table 15), meaning that on average, teachers only managed about one quarter of the tasks in the pedagogic test. Pedagogical skills, or more accurately the lack of skills, appeared to be similar regardless of ownership or location of the school.

## Table 15. Teachers pedagogy assessment

| Percent | All | Public | Private | Percent Difference (%) | Urban Public | Rural Public | Percent Difference (%) |
|---|---|---|---|---|---|---|---|
| **Pedagogy** | **25.5** | **25.9** | **24.3** | **6.5** | **26.8** | **25.5** | **5.2** |
| Lesson preparation | 31.1 | 31.5 | 29.8 | 5.7 | 31.2 | 31.7 | -1.5 |
| Pupil comparisons | 25.4 | 25.7 | 24.4 | 5.3 | 27.6 | 24.8 | 11.1 |
| Pupil evaluations | 11.3 | 11.8 | 9.8 | 20.2 | 13.6 | 11.0 | 23.1 |

Note: Level of significance: *** p < 0.01; ** p < 0.05; * p < 0.1.

The first section of the pedagogy test asked teachers to prepare a lesson plan about road accidents in Uganda based on a simple information-giving text they had read. The average score on this task was 31.3 percent. The second task asked teachers to assess pupils' writing on the basis of two sample letters (written by grade four pupils). The average score on this task was 25.4 percent. The final task, which asked teachers to inspect test scores of 10 pupils, aggregate them, and make some statements about patterns of learning, received an extremely low score of 11.3 percent. Although all scores were quite low, it is interesting to note that private and rural public schools performed worse on all three parts of the pedagogy section than their comparators.

The low scores on the pedagogy section, combined with the performance on the curriculum content, imply that teachers knew little more than their pupils and that the little they did know, they could not teach adequately.

Figure 4, which depicts the full profile of teachers with respect to the level at which minimum knowledge was set, clearly shows how weak Ugandan teachers were in pedagogy. Fewer than 10 percent of the teachers managed to correctly answer half of the questions in the pedagogy test.

**Figure 4. Sensitivity of "minimum knowledge" to the cut-off point**

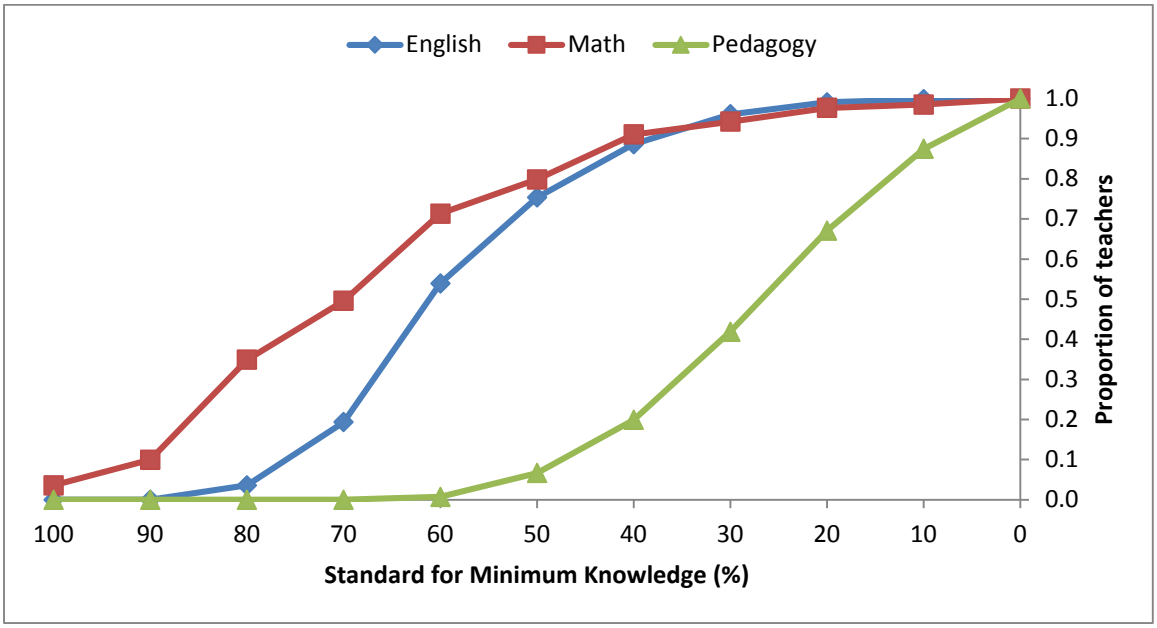
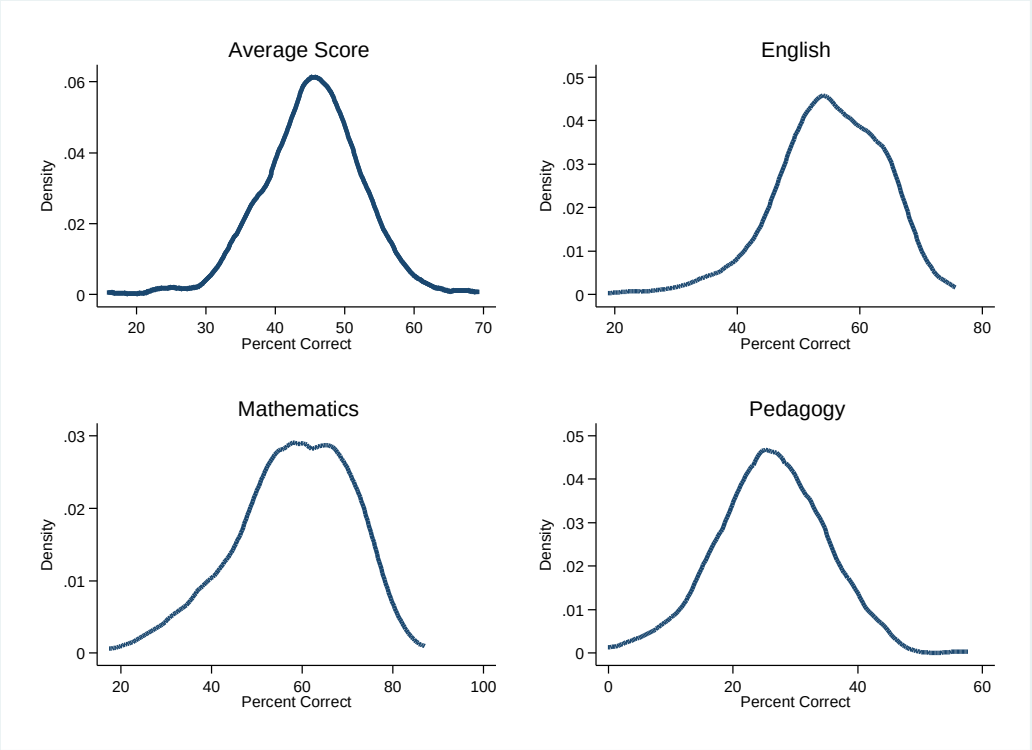


**Figure 5. Distribution of teacher scores**




## D. Availability of inputs at the school

The indicators *minimum equipment availability*, *minimum infrastructure availability*, *observed pupil-teacher ratio*, and *share of pupils with textbook* were all constructed using data collected through visual inspections of a primary 4 classroom and the school premises in each primary school. Below, we discuss each indicator in more detail. Table 16 and Table 17 summarize the findings (which are duplicated in Table C4 in Annex C for ease of reference).

*Minimum equipment availability*

**Methodological Note**

*Minimum equipment availability* is a binary indicator capturing the availability of: (i) functioning blackboard and chalk and (ii) pens, pencils and exercise books in 4th grade classrooms. In one randomly selected 4th grade classroom in the school the enumerator assessed if there was a functioning blackboard by looking at whether text written on the blackboard could be read at the front and back of the classroom, and whether there was chalk available to write on the blackboard. We considered that the classroom met the minimum requirement of pens, pencils and exercise books if both the share of pupils with pen or pencils and the share of pupils with exercise books were above 90%.

## Table 16. School indicators by sector and location

| | Uganda | Public | Private | Percent Difference (%) | Urban Public | Rural Public | Percent Difference (%) |
|---|---|---|---|---|---|---|---|
| **Minimum equipment availability (% of schools)** | **80.7** | **80.0** | **82.5** | **-3.0** | **85.1** | **78.5** | **8.4** |
| Pupils with pencils (% pupils) | 98.7 | 98.6 | 99.1 | -0.5 | 99.0 | 98.5 | 0.5 |
| Pupils with exercise books(% pupils) | 99.0 | 99.4 | 98.0 | 1.4 | 99.5 | 99.3 | 0.1 |
| Classroom with board (% classrooms) | 99.8 | 99.7 | 100.0 | -0.3 | 100.0 | 99.6 | 0.4 |
| Classroom with chalk (% classrooms) | 98.1 | 97.8 | 99.0 | -1.2 | 97.2 | 98.0 | -0.8 |
| Contrast to read board (% of schools) | 1.1 | 1.1 | 1.1 | 3.2 | 1.2 | 1.1 | 2.9 |
| **Minimum infrastructure availability (% of schools)** | **53.5** | **58.7** | **38.2** | **53.5**** | **66.0** | **56.5** | **16.8** |
| Minimum visibility (% classrooms) | 90.3 | 90.5 | 89.6 | 1.0 | 89.1 | 90.9 | -2.0 |
| Toilet clean (% schools) | 70.7 | 72.1 | 66.5 | 8.4 | 83.2 | 68.7 | 21.0 |
| Toilet private (% schools) | 84.6 | 90.6 | 66.8 | 35.7*** | 90.6 | 90.6 | 0.1 |
| Toilet accessible (% schools) | 96.4 | 97.2 | 93.9 | 3.5 | 98.6 | 96.8 | 1.8 |
| **Observed pupil-teacher ratio** | **44.6** | **50.4** | **27.3** | **84.6***** | **57.1** | **48.4** | **18.0** |
| **Textbook availability (% pupils)** | **4.6** | **5.6** | **1.2** | **378.2** | **6.6** | **5.4** | **22.6** |
| English textbook availability (% pupils) | 3.7 | 4.6 | 0.8 | 481.3 | 2.5 | 5.3 | -52.7 |
| Mathematics textbook availability (% pupils) | 5.2 | 6.4 | 1.4 | 341.7 | 10.0 | 5.4 | 84.4 |

Of the input indicators, *minimum equipment availability* appeared less of a constraint. All Ugandan primary schools seemed to possess the minimum teaching equipment required. Indeed, as shown in Table 16 and Table 17, all sub-indicators were close to 100 percent, except "contrast to read the board" which was extremely low. In 98.9 percent of schools, the primary four classroom was judged by the enumerator as not having enough contrast to allow proper reading from a distance. It was in the Eastern region that this issue was most prevalent with around 30 percent of the classrooms concerned. There was almost no variation across public/private or urban/rural public schools.

## Table 17. School Indicators by region

| | Uganda | Central | Eastern | Kampala | Northern | Western |
|---|---|---|---|---|---|---|
| **Minimum equipment availability (% of schools)** | **80.7** | **81.1** | **67.6** | **92.7** | **93.8** | **83.3** |
| Pupils with pencils (% pupils) | 98.7 | 98.6 | 98.2 | 99.3 | 98.8 | 99.2 |
| Pupils with exercise books (% pupils) | 99.0 | 99.3 | 97.5 | 99.8 | 100.0 | 99.5 |
| Classroom with board (% classrooms) | 99.8 | 100.0 | 100.0 | 100.0 | 100.0 | 99.3 |
| Classroom with chalk (% classrooms) | 98.1 | 100.0 | 99.7 | 100.0 | 98.8 | 94.6 |
| Contrast to read board (% of schools) | 1.1 | 87.3 | 70.2 | 93.0 | 96.0 | 88.0 |
| **Minimum infrastructure availability (% of schools)** | **53.5** | **49.8** | **50.0** | **67.2** | **65.5** | **52.0** |
| Minimum visibility (% classrooms) | 90.3 | 85.5 | 82.1 | 75.5 | 97.3 | 99.3 |
| Toilet clean (% schools) | 70.7 | 59.1 | 70.1 | 91.7 | 66.8 | 81.8 |
| Toilet private (% schools) | 84.6 | 93.0 | 83.8 | 99.4 | 93.7 | 71.2 |
| Toilet accessible (% schools) | 96.4 | 97.3 | 96.4 | 100.0 | 100.0 | 93.1 |
| **Observed pupil-teacher ratio** | **44.6** | **32.1** | **58.6** | **37.3** | **62.0** | **35.3** |
| **Textbook availability (% pupils)** | **4.6** | **7.4** | **3.8** | **1.4** | **0.8** | **4.9** |

| | | | | | | |
|---|---|---|---|---|---|---|
| English textbook availability (% pupils) | 3.7 | 9.3 | 0.4 | 1.2 | 2.0 | 2.1 |
| Mathematics textbook availability (% pupils) | 5.2 | 6.0 | 5.6 | 1.8 | 0.0 | 7.4 |

*Minimum infrastructure availability*

**Methodological Note**

*Minimum infrastructure availability* is a binary indicator capturing the availability of: (i) functioning toilets and (ii) classroom visibility. Functioning toilets is defined as whether toilets were functioning, accessible, clean and private (enclosed and with gender separation) as verified by an enumerator. To verify classroom visibility we randomly selected one 4th grade classroom in which the enumerator placed a printout on the board and checked whether it was possible to read the printout from the back of the classroom.

*Share of pupils with textbooks* reflects the typical ratio in pupil to textbooks in a 4th grade classroom. It is measured as the number of pupils with the relevant textbooks (language or mathematics conditional on which randomly selected class is observed) in one randomly selected 4th grade class and divided by the number of pupils in that classroom.

*Observed pupil-teacher ratio* reflects the typical ratio of pupils to teachers in a 4th grade classroom. It is measured as the number of pupils in one randomly selected 4th grade class at the school.

Overall, Ugandan schools scored poorly on *minimum infrastructure availability* with only 53.5 percent of them meeting the standard. Public schools outperformed private schools, 58.7 percent vs. 38.2 percent.

Central and Eastern regions were below average and rural school infrastructure was sub-par compared to urban schools.

There was close to universal access to toilets in Uganda's primary schools and almost all of them were private and accessible. Private schools, however, did not have a good record on privacy for toilets with one out of three of them having toilets with no privacy. This was also true for Western region schools. Toilet cleanliness was a serious issue across the board for the schools. Overall, only 70.7 percent of the schools had toilets which were deemed clean. Once again, private schools fared poorly on this sub-indicator, as did the Central and Northern regions. On the sub-indicator, "visibility", it is surprising to note that in one out of four schools in Kampala, pupils had more difficulty reading what was written on the board. Table C 4 compiles all results for school inputs across the regions, by ownership, and by location. With only 4.6 percent of the pupils with access to an English or mathematics textbook, Ugandan primary pupils seemed to learn in a textbook-free environment.

Table 16 and Table 17 provide the statistics on the share of pupils who had or were sharing a textbook broken down by subject area (English and mathematics). First, it is important to state that in 95 percent of the schools, none of the pupils had a textbook during the lesson. In the remaining 5 percent of schools in which textbooks were available, about 1.5 children had to share a textbook.[8] Pupils in private schools were, on average, more than three times more likely to share a book than pupils in public schools. Interestingly, even though mathematics textbooks were more prevalent than

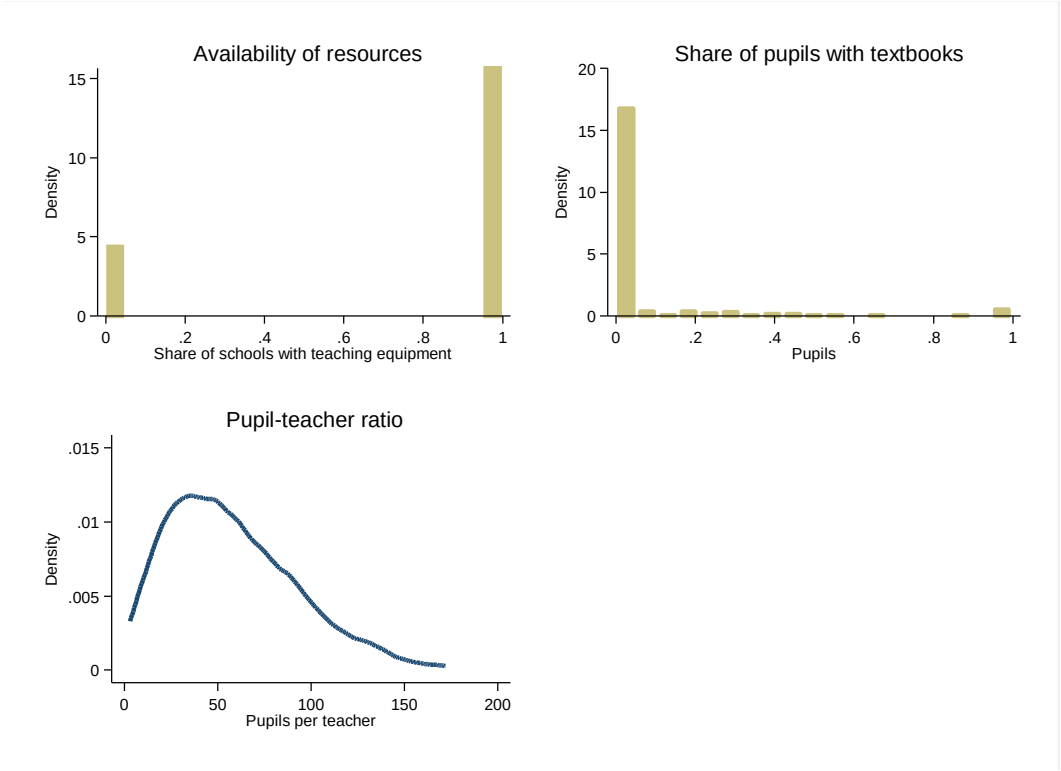
[8] Tables for these values have not been produced, but are based on the author's calculations of the Uganda SDI data.

English textbooks, pupils performed better on the English section of their skills assessment (Table 19).

The *observed pupil-teacher ratio* stood at 44.6. Public school classes had 23 more pupils (50:1) than private school classes (27:1). Crowding was also more severe in urban public schools with an average class sizes of 57 pupils as compared to rural schools with 48 pupils per teacher. Figure 6 confirms these results in the distribution graphs shown.

There was also a lot of regional variation in the *observed pupil-teacher ratio* across Uganda. The Northern region had the highest pupil teacher ratio, which stood at 62:1 followed by the Eastern region at 59:1. Comparatively, Kampala schools had 37 pupils per teacher well below the national average.

**Figure 6. Distribution of the input indicators**




# IV. ASSESSMENT OF PUPIL LEARNING

The overall results for the English and mathematics scores are reported in Table 18 and Table 19. Overall, pupils answered 48.7 percent of questions on the test correctly.[9] Pupils scored better in mathematics with an average score of 55.6 percent compared to 47.2 percent in English. The pupils

[9] The total score was a simple average of all questions in the English and mathematics sections. A correct answer collected one point and a wrong answer was worth zero.

were also tested on four non-verbal reasoning questions, on which they received an average score of 57 percent. While the average total scores provide interesting information, looking into the details of the test could give even more insights. Table C 6 breaks down the results for the English and mathematics sections of the test.

For English, close to nine out of 10 pupils (86.1 percent) managed the simplest task of identifying a letter, but only two thirds (75.7 percent) could recognize a simple word. The performance significantly dropped down when more complex tasks were involved. Indeed, only 53 percent could read all 10 words of a sentence correctly and 9.7 percent could read all 58 words in a simple paragraph. Given this, it was not surprising that around one out of 10 primary four pupils (0.75 percent) could answer a comprehension question about the passage.

Mathematics scores were slightly better with the pupils displaying some significant knowledge gaps. In terms of single digit operations, the pupils performed better in addition and subtraction than in division and multiplication. Pupils seemed in their comfort zone when it came to the manipulation of single-digit numbers (although only 23.8 percent could multiply a pair of single-digit numbers). However, they performed poorly for any operation involving two- or three-digit numbers. For instance, only 1.5 percent could multiply double digits and 13.0 percent could divide double digits. Furthermore, pupils' double-digit subtraction skills (27.3 percent) were poorer than their skills in single digit division (36.8 percent). Very few pupils could perform on questions that required higher analytical skills such as problem-solving tasks.

The mathematics test revealed that the majority of primary four pupils did not perform well at the primary three level. For example, the complete 9x9 multiplication table was intended to be taught in primary three; simple division was also clearly in the curriculum. However, only 36.8 percent of the primary four pupils could perform 6÷3 and 23.8 percent were able to provide the correct answer for 7x8.

Pupils in private schools performed significantly better both in English and mathematics than their public school counterparts, correctly answering 27.7 percent and 15.6 percent more questions, respectively (Table 18). They also outperformed public school pupils on non-verbal reasoning by 6 percentage points. For multiplication involving one-digit numbers, private school pupils outperformed those from public schools by more than two to one. For more complex operations, such as division or multiplication with two-digit numbers, all pupils performed poorly, but still pupils in private schools were roughly three times more likely to get it right than public school pupils (29.3 percent vs. 10.6 percent and 3.5 percent vs. 1.2 percent, respectively).

## Box 4: Background on the SDI Pupil Assessment

It is instructive to think of the Service Delivery Indicators as measuring key inputs, with a focus on what teachers do and know, in an education production function. These inputs are actionable and they are collected using objective and observational methods at the school level. The outcome in such an education production function is pupil learning achievement. While learning outcomes capture both school-specific inputs (e.g., the quality and effort exerted by the teachers) and various child-specific factors (e.g., innate ability) and household-specific factors (e.g., the demand for education), and thus provide, at best, reduced form evidence on service provision, it is a still an important measure to identify gaps and to track progress in the sector. Moreover, while the Service Delivery Indicators measure inputs -- and learning outcomes are not part of the Indicators -- in the final instance we should be interested in inputs not in and of themselves, but only in as far as they deliver the outcomes we care about. Therefore, as part of the collection of the Service Delivery Indicators in each country, learning outcomes are measured for grade four pupils.

The objective of the pupil assessment was to measure basic reading, writing, and arithmetic skills. The test was designed by experts in international pedagogy and based on a review of primary curriculum materials from 13 African countries (For details on the design of the test, see Johnson, Cunningham and Dowling (2012) "Draft Final Report, Teaching Standards and Curriculum Review"). The pupil assessment also measured nonverbal reasoning skills on the basis of Raven's matrices, a standard IQ measure that is designed to be valid across different cultures. This measure complements the pupil test scores in language and mathematics and can be used as a rough measure to control for innate pupil ability when comparing outcomes across different schools. Thus, the pupil assessment consisted of three parts: language, mathematics and non-verbal reasoning (NVR).

The test, using material up to the grade three level was administered to grade four pupils. The reason for choosing pupils in grade four is threefold. First, there is scant information on achievement in lower grades. SACMEQ, for example, tests pupils in grade six. Uwezo is a recent initiative that aims to provide information on pupils' learning irrespective of whether they are enrolled in school or not and tests all children under the age of 16 on grade two material. While this initiative has provided very interesting results, it is not possible to link pupil achievement to school level data, since the survey is done at the household level. Second, the sample of children in school becomes more and more self-selective as one goes higher up due to high drop-out rates. Finally, there is growing evidence that cognitive ability is most malleable at younger ages. It is therefore especially important to get a snapshot of pupil learning and the quality of teaching provided at younger ages.

The test was designed as a one-on-one test with enumerators reading out instructions to pupils in their mother tongue. This was done to build up a differentiated picture of pupils' cognitive skills; i.e. oral one-to-one testing allows us to evaluate whether a child can solve a mathematics problem even when her reading ability is so low that she would not be able to attempt the problem independently. The language test consisted of a number of different tasks ranging from testing knowledge of the alphabet, to word recognition, to a more challenging reading comprehension test. Altogether, the test included six tasks. The mathematics test also consisted of a number of different tasks ranging from identifying and sequencing numbers, to addition of one- to three-digit numbers, to one- and two-digit subtraction, to single digit multiplication and divisions. The mathematics test included six tasks and a total of 17 questions. The non-verbal reasoning section consisted of four questions.

## Table 18. Pupil performance metrics

| Average score in percent | All | Public | Private | Percent Difference (%) | Urban | Rural | Percent Difference (%) |
|---|---|---|---|---|---|---|---|
| **Overall pupil test score** | **48.6** | **45.4** | **70.6** | **-35.7*** ** | **59.3** | **43.9** | **35.2*** ** |
| **English score** | **47.1** | **43.5** | **71.2** | **-38.9*** ** | **59.1** | **41.8** | **41.6*** ** |
| Identify a letter | 86.1 | 84.5 | 96.3 | -12.3*** | 92.2 | 83.3 | 10.6*** |
| Identify basic words | 75.7 | 73.2 | 91.6 | -20.1*** | 84.6 | 71.6 | 18.2*** |
| Read sentence | 53.0 | 49.3 | 77.1 | -36.1*** | 66.0 | 47.1 | 40.1*** |
| Read a paragraph | 9.7 | 6.4 | 30.9 | -79.1*** | 17.4 | 6.2 | 181.4*** |
| Reading comprehension | 24.9 | 21.4 | 48.3 | -55.8*** | 39.6 | 18.3 | 116.8*** |
| **Mathematics score** | **55.5** | **53.5** | **69.1** | **-22.6*** ** | **60.0** | **53.6** | **11.9*** ** |
| Single-digit addition | 82.4 | 80.9 | 92.4 | -12.5*** | 85.5 | 81.1 | 5.4** |
| Double-digit addition | 56.3 | 53.1 | 76.7 | -30.8*** | 61.7 | 53.8 | 14.6** |
| Single-digit subtraction | 76.2 | 74.2 | 89.0 | -16.6*** | 80.3 | 74.3 | 8.1** |
| Double-digit subtraction | 27.3 | 24.0 | 49.0 | -51.1*** | 34.4 | 24.1 | 42.8*** |
| Single-digit multiplication | 23.8 | 20.7 | 43.8 | -52.7*** | 32.0 | 20.0 | 59.9*** |
| Double-digit multiplication | 1.5 | 1.2 | 3.5 | -67.1** | 2.4 | 1.1 | 124.9 |
| Single-digit division | 36.8 | 33.8 | 56.7 | -40.5*** | 41.4 | 34.7 | 19.2** |
| **Non-verbal reasoning score** | **56.9** | **56.2** | **62.2** | **-9.5*** ** | **60.7** | **55.4** | **9.6** ** |
| Number of pupils | 3,966 | 3,181 | 785 | | 470 | 2,711 | |

Note: Level of significance: *** p < 0.01; ** p < 0.05; * p < 0.1.

## Table 19. Primary four pupils' performance: additional breakdowns

| Average score in percent | Overall score | English | Mathematics | Non-verbal reasoning |
|---|---|---|---|---|
| **Uganda** | **48.6** | **47.1** | **55.5** | **56.9** |
| **Central** | 67.5 | 68.2 | 65.0 | 61.8 |
| **Eastern** | 39.1 | 36.2 | 51.4 | 56.1 |
| **Kampala** | 83.0 | 85.7 | 71.1 | 67.1 |
| **Northern** | 37.9 | 35.5 | 48.4 | 51.3 |
| **Western** | 55.9 | 55.1 | 59.9 | 58.3 |
| **Had Breakfast** | 54.0 | 53.2 | 57.9 | 57.8 |
| **No Breakfast** | 41.4 | 38.9 | 52.5 | 55.8 |

Table 20 shows that urban girls and boys scored significantly better overall (62.5 percent and 62.1 percent, respectively) than rural girls and boys (43.5 percent and 45.8 percent, respectively), as well as on each section of the assessment. The greatest difference was between urban and rural girls in English, where girls in urban schools scored 21.5 points better than rural girls. In urban schools, there was little difference between genders. Urban school girls did score slightly higher overall and in the English section, but urban boys scored better in mathematics and non-verbal reasoning. In rural locations, boys outperformed girls in all parts of the test, but not significantly so.

Looking at the breakdown of gender and school ownership (Table 21), a similar trend appeared with boys and girls in private schools outperforming public school pupils in all aspects of the test. Private school girls achieved the highest scores overall (72.5 percent) and in the English section (73.6 percent). Again, the largest difference in scores was in the English section with private school girls scoring 31 points higher than girls in public schools. When considering the private sector alone, girls scored better in the language section and performed significantly better than boys overall. Looking within public schools, boys achieved better results than girls, although only slightly so, in all parts of the test with the largest gap appearing in mathematics (5 percentage point difference).

**Table 20. Pupil evaluation: gender and location**

| (Percent) | All | Urban boys | Rural boys | Urban girls | Rural girls | Percent Difference (Urban boys-Rural boys) | Percent Difference (Urban boys-Urban girls) | Percent Difference (Urban boys-Rural girls) | Percent Difference (Urban girls-Rural girls) |
|---|---|---|---|---|---|---|---|---|---|
| **Overall score** | 48.7 | 59.8 | 45.0 | 58.8 | 42.7 | 33.0*** | 1.8 | 40.0*** | 37.5*** |
| **English** | 47.2 | 59.5 | 42.7 | 58.7 | 40.8 | 39.4*** | 1.3 | 45.8*** | 44.0*** |
| **Mathematics** | 55.6 | 61.5 | 56.0 | 58.7 | 51.3 | 9.8*** | 4.7 | 20.0*** | 14.6*** |
| **Non-verbal reasoning** | 57.0 | 61.7 | 56.1 | 59.6 | 54.6 | 10.0*** | 3.6 | 13.1*** | 9.2*** |

Note: Results based on 3,966 pupils in 400 schools. Differences are relative to urban school boys, except for the final difference which compares urban girls to rural girls. Level of significance: *** p < 0.01; ** p < 0.05; * p < 0.1.

**Table 21. Pupil evaluation: gender and school ownership**

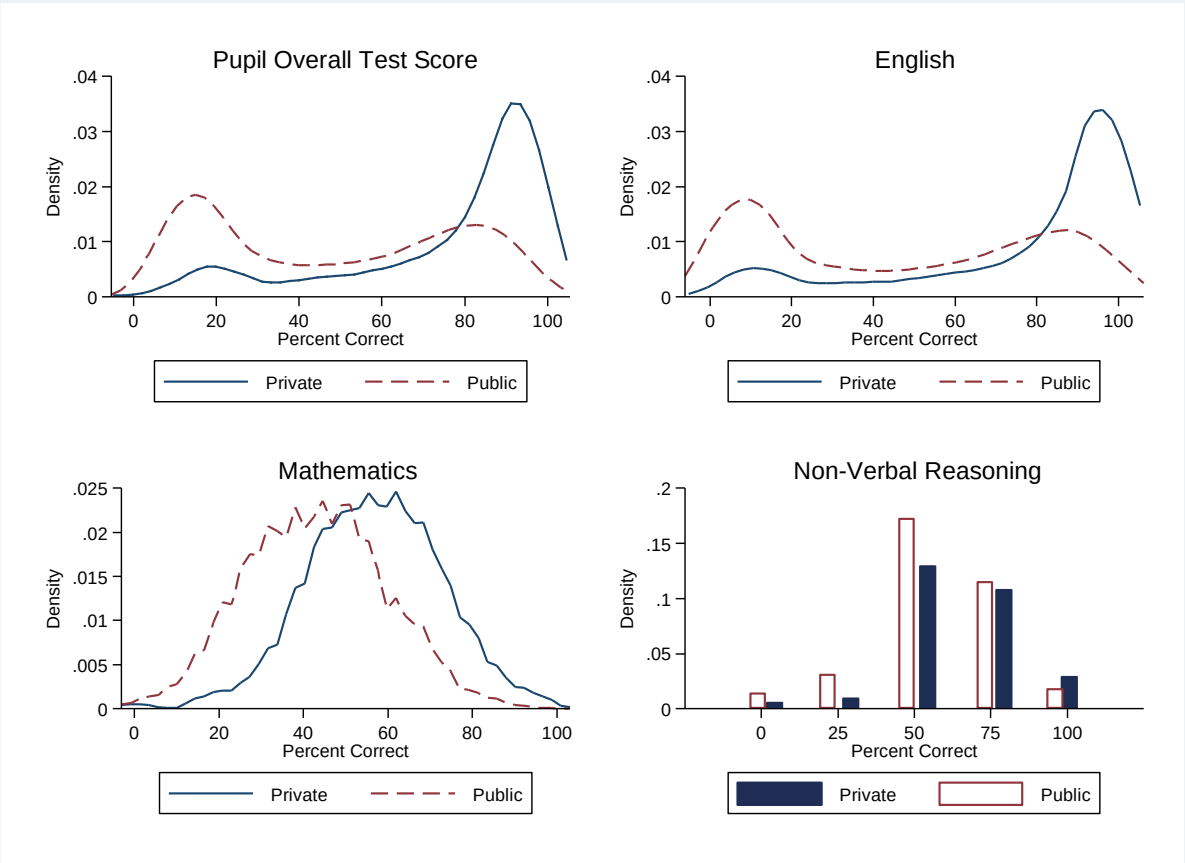
| (Percent) | All | Private boys | Public boys | Private girls | Public girls | Percent Difference (Private boys-Public boys) | Percent Difference (Private boys-Private girls) | Percent Difference (Private boys-Public girls) | Percent Difference (Private girls-Public girls) |
|---|---|---|---|---|---|---|---|---|---|
| **Overall score** | 48.7 | 68.3 | 46.8 | 72.5 | 43.9 | 46.0*** | -5.8 | 55.4*** | 65.0*** |
| **English** | 47.2 | 68.4 | 44.8 | 73.6 | 42.2 | 52.8*** | -7.0 | 62.1*** | 74.2*** |
| **Mathematics** | 55.6 | 69.1 | 56.0 | 69.2 | 51.2 | 23.3*** | -0.2 | 35.0*** | 35.2*** |
| **Non-verbal reasoning** | 57.0 | 63.0 | 57.1 | 61.4 | 55.3 | 10.4*** | 2.5 | 13.8*** | 11.1*** |

Note: Results based on 3,966 pupils in 400 schools. Differences are relative to private school boys, except for the final difference which compares private girls to public girls. Level of significance: *** p < 0.01; ** p < 0.05; * p < 0.1.

Unlike their teachers' assessment, there was a tremendous amount of regional variation in the pupils' test scores (Table C 6). Pupils in the Northern and Eastern regions performed rather poorly in both mathematics and English when compared to the other pupils. Kampala pupils were on the top of the cohort with an average English score more than double that of Northern pupils. Only 12.5 percent of pupils from the Northern region could multiply two single-digit numbers. Rural public pupils' performance was also significantly poorer than urban public pupils' on average and for a majority of specific English and mathematics

questions. It seems that socio-economic status had a lot to do with these results since pupils who had breakfast before coming to school, who on average probably lived in better-off households, out-performed pupils who showed up at school with an empty stomach (Table 19). There was no noticeable difference between boys and girls except for few questions.

**Figure 7. Pupil evaluation distribution by ownership**




The inequality in test scores between pupils attending public or private schools is captured in Figure 7**Error! Reference source not found.**. The national distribution of test scores was clearly bimodal suggesting that there were two distinct groups of pupils (i) the poor performers on the left hump and (ii) the stronger performers on the right hump. The group of poor performers was clearly larger than that of strong performers as shown by the size of the humps. The poor performers had an average score around 20 percent, whereas the strong performers scored slightly more than 80 percent. Few pupils were scattered between these two groups. The regional densities (Table C5) clearly showed that the poor performers were concentrated in the Northern and Eastern regions, whereas most of the strong performers were in Kampala. Indeed the distribution for Northern and Eastern (resp. Kampala) were strongly skewed to the left (resp. right) of the score axis. Central and Western regions seemed to host a bit of both populations. The distributions for public and private pupils were also bimodal with the better performers more heavily concentrated in the private schools. The same was true for the rural/urban distributions.

*Correlations between indicators and outcomes*

With outcome data in education, one can also check whether the input measures were in some way related to outcomes. Of course, these are mere correlations that cannot be interpreted causally. Nevertheless, the focus on Service Delivery Indicators only makes sense if they speak to the question of how to improve outcomes. Therefore, it is interesting to examine how the Service Delivery Indicators correlate with educational achievement.

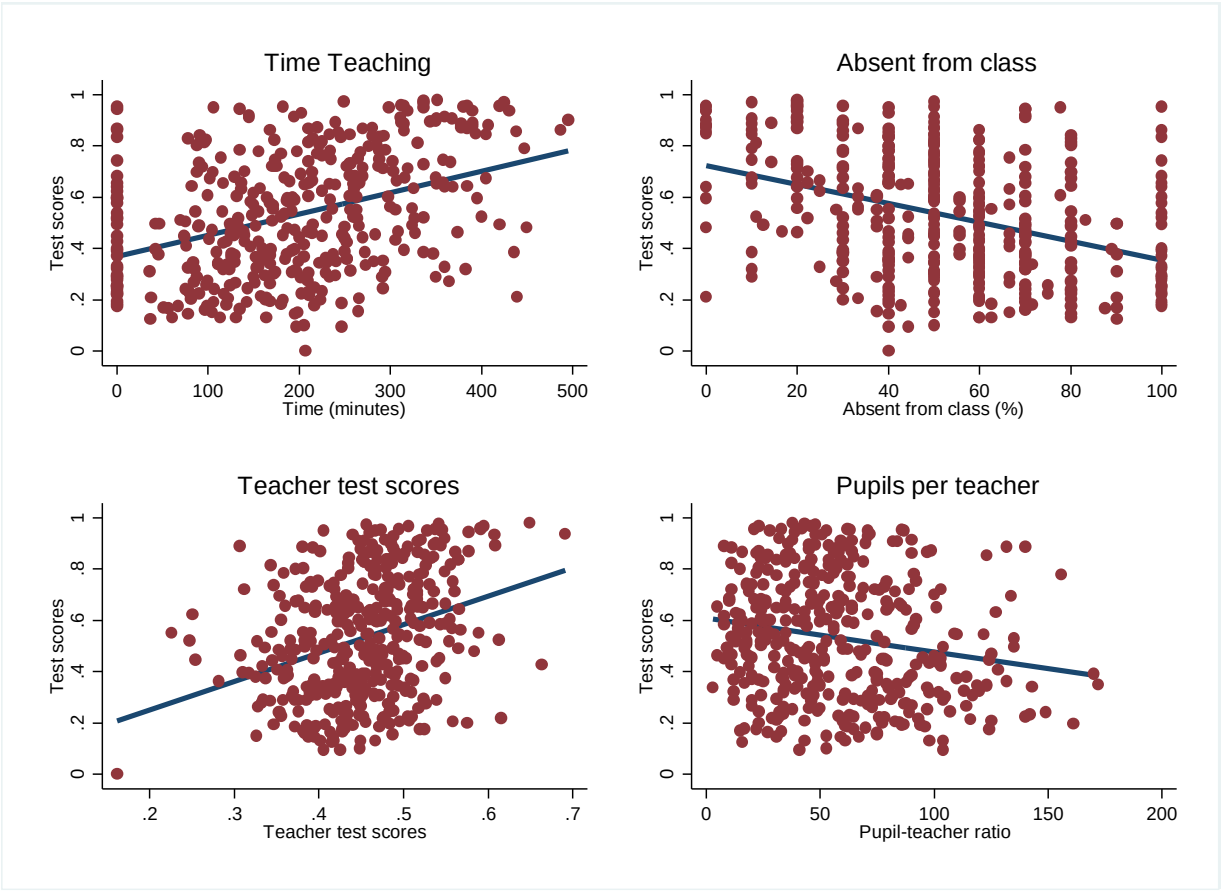
Table C 7 depicts unconditional correlations between pupil achievement and the education indicators. Panel A pools data from all schools, while Panel B uses data from public schools only and controls for the difference between urban and rural schools. Fairly strong relationships were shown between the indicators and pupil knowledge in Panel A. All the correlations had the expected sign and were significant for all indicators, except for *minimum infrastructure availability*.

In Panel B, depicting correlations in the sample of public schools, the patterns in the data remain broadly the same. Higher absence rates (from school and classroom) and higher pupil-teacher ratio were significantly negatively correlated with the pupil test scores. *Time spent teaching*, all teacher test scores, *minimum equipment availability*, and *share of pupils with textbooks* were significantly positively correlated with test scores. Although not significant, there was a negative correlation between *minimum infrastructure availability* and pupils' test results. Table C 8 offers a detailed breakdown of the correlates of pupil performance on the assessment.

Figure 8 provides a graphical illustration of these correlations. The trend line shown in each scatter plot graph confirms the correlations with the SDI indicators and pupil test scores mentioned above. As the teacher spent more time absent from the class and as the class size increased, the pupils' test results dropped. Conversely, as the teacher spent more time instructing pupils and performed better on the skills assessment, pupils performed better on the test.

The relationships between teacher's knowledge of English and mathematics and pupils' test results in public and private schools and schools in the urban and rural areas are explored in Figure C 4. It is apparent that the level of teachers' knowledge of their subject matter was relatively equal regardless of the ownership or location of the school in which they worked. Yet, despite the fact that all teachers possessed basically the same level of knowledge, pupils in private schools and those in urban settings performed better on the pupil test than their counterparts in the public and rural schools. Many factors could explain this disparity in pupils' performance. However, when considering ownership, it seemed apparent that one of the most glaring differences between public and private teachers was the amount of time they spent teaching in the classroom. Teachers in the private sector gave roughly 1 hour and 25 minutes more instructional time to their pupils each day (Table 6). In other words, private school children received about two to three extra lessons per day as compared to their public school counterparts.

**Figure 8. Correlations between indicators and learning (pupil test scores)**




# V. WHAT DOES THIS MEAN FOR UGANDA?

Uganda has one of the youngest populations in the world and has made great progress in expanding access to education. As of 2012, more than 8.4 million pupils were enrolled in its primary schools. However, increased access to education was not accompanied by improvement in learning outcomes. As several recent studies have shown, too many school-going children still cannot properly read and count. Recent evidence showed that cognitive skills were much more important in promoting economic growth than number of years of schooling. This puts the spotlight on the quality of schooling.

To achieve its ambitious but attainable Vision 2040, Uganda needs to accelerate economic growth. Building a well-educated labor force is critically important. The SDI showed that although teachers functioned in a relatively decent working environment, a number of challenges needed to be urgently addressed. More than half of the teachers were missing in action and not found in the classroom teaching pupils. The SDI also uncovered significant knowledge gaps for teachers. If not addressed, these service delivery failures would hamper Uganda's effort to build an educated workforce. The SDI also showed serious regional inequalities, which will likely feed into greater income and welfare

inequality in the future. This, again, hampers the shared growth agenda and undermines the effort to build a cohesive and prosperous Uganda.

Over the past two decades, Uganda has made tremendous progress on economic growth, poverty reduction, as well as on some human development indicators. The results of the SDI, however, showed that to sustain or accelerate this progress, Uganda would need to focus on raising quality and efficiency in the education sector. The discovery of oil could be transformational for Uganda in terms of its vision for 2040, but only if the quality agenda is addressed in education. Only then can natural resources revenues be translated into long-term economic growth that benefits all Ugandans.

# VI. COMPARISON OF SDI RESULTS ACROSS COUNTRIES

Table 22 compares Uganda's results to all other SDI countries for public schools. Uganda was the second country, after Kenya, to have implemented SDI and was the first fully comparable to another country, Kenya, having used the same instruments. Teachers and pupils were assessed with the exact same questions except for minor changes, particularly to names to contextualize the survey instruments. The same questions were also asked to the heads of schools. Finally, during the analysis, the indicators were computed with the same program, maximizing the comparability between Uganda and Kenya SDI. The instruments used in Tanzania and Senegal, where SDI was piloted, also overlap a great deal with the Uganda and Kenya SDI results, but there are few indicators which are not comparable.

In the area of teacher effort, both *school absence rate* and *classroom absence rate* in Uganda were among the highest, along with Tanzania (2011) and Mozambique (2014).

Uganda also had the highest difference between the *scheduled teaching time* (7hr 13min) and *time spent teaching* (2hr 55min) with 4hr 16min being lost. Uganda was also among the highest performing countries in regards to *minimum knowledge* among teachers, scoring only slightly lower than Tanzania (2014) and 15 percentage points less than Kenya. Teacher test scores were also high with, once again, only Kenya and Tanzania (2014) having higher scores.

When compared to their regional neighbors to the east, teachers in Uganda had weaker mathematics skills than their Kenyan counterparts (Figure C 3). In fact, Ugandan teachers scored lower overall, as well as in 13 of the 14 mathematical topics covered on the assessment. The largest gaps in knowledge and ability were in comparing fractions, reading a clock, interpreting graphical data, division of fractions, and one-variable algebra problems. Ugandan teachers appeared to be much less prepared to teach their subject matter than Kenyan teachers did.

Uganda's pupil-teacher ratio was among the highest (50:1); only Tanzania (2011) had a higher pupil-teacher ratio, compared to the other countries. The percentage of pupils with textbooks was the lowest, only 5.6 percent, and significantly lower than any other comparative country. Equipment and infrastructure availability were among the highest.

Annex C provides more information on SDI country comparisons by looking at private schools only (Table C 9) and all schools (Table C 10).

## Table 22. SDI At-a-Glance

| Public schools only | Uganda 2013 | Average SDI | Kenya 2012 | Mozambique 2014 | Nigeria[a] 2013 | Senegal 2011 | Tanzania 2014 | Tanzania 2011 | Togo 2013 |
|---|---|---|---|---|---|---|---|---|---|
| **Teacher Ability** | | | | | | | | | |
| Minimum knowledge (% teachers) | 19.4 | **12.7** | 34.8 | 0.3 | 2.4 | Not Comparable | 15.6 | Not Comparable | 0.9 |
| Test score (out of 100) | 45.5 | **42.0** | 55.6 | 26.9 | 30.5 | Not Comparable | 46.6 | Not Comparable | 33.9 |
| **Teacher Effort** | | | | | | | | | |
| School absence rate (% teachers) | 26.6 | **20.1** | 15.2 | 44.8 | 16.9 | 18.0 | 15.3 | 23.0 | 22.6 |
| Classroom absence rate (% teachers) | 56.3 | **42.1** | 47.3 | 56.2 | 22.8 | 29.0 | 46.7 | 53.0 | 39.3 |
| Time spent teaching per day | 2h 55min | **2h 53min** | 2h 30min | 1h 41 min | 3h 10min | 3h 15min | 2h 57min | 2h 04min | 3h 15min |
| *Scheduled teaching time per day* | *7h 13min* | ***5h 31min*** | *5h 31min* | *4h 17min* | *4h 44min* | *4h 36min* | *5h 54min* | *5h 12min* | *5h 28min* |
| **Availability of Inputs** | | | | | | | | | |
| Observed pupil-teacher ratio | 50.4 | **42.1** | 39.3 | 21.4 | 21.5 | 34.0 | 40.6 | 74.0 | 31.4 |
| Textbook availability (% pupils) | 5.6 | **37.2** | 44.5 | 68.1 | 33.7 | Not Comparable | 25.9 | Not Comparable | 76.0 |
| Minimum equipment availability (% classrooms) | 80.0 | **57.8** | 74.3 | 76.8 | 48.2 | Not Comparable | 62.4 | Not Comparable | 24.3 |
| Minimum infrastructure availability (% schools) | 58.7 | **36.2** | 60.2 | 29.1 | 13.4 | Not Comparable | 36.0 | Not Comparable | 14.4 |
| **Pupil Learning** | | | | | | | | | |
| Language and mathematics test score (out of 100) | 48.4 | **45.4** | 69.4 | 20.8 | 25.1 | Not Comparable | 49.2 | Not Comparable | 38.1 |
| Language test score (out of 100) | 43.4 | **44.8** | 72.5 | 18.7 | 23.3 | Not Comparable | 47.9 | Not Comparable | 36.9 |
| Mathematics test score (out of 100) | 53.4 | **45.2** | 57.4 | 25.1 | 28.2 | Not Comparable | 57.5 | Not Comparable | 41.3 |

Note:
a. Values for Nigeria are the weighted average of the four states surveyed, namely Anambra, Bauchi, Ekiti, and Niger.
b. These numbers reflect the updated SDI methodology. More information on SDI methodology can be found at www.SDIndicators.org.
c. Full definitions of the indicators are found in Annex B.

# VII. ANNEXES

## ANNEX A. SAMPLING STRATEGY

## ANNEX B. DEFINITION OF INDICATORS

## ANNEX C. ADDITIONAL RESULTS

# ANNEX A. SAMPLING STRATEGY

The overall objective of the SDI was to produce accurate and representative indicators at the national, urban and rural levels. In some countries, like Uganda, it was required that the indicators be structured at a lower level of representativeness (e.g., region or province). The main units of analysis were facilities (schools), as well as providers (teachers). The SDI also aimed to produce accurate information on primary four pupils' performance on English and mathematics.

## A1. Sampling Frame for the 2013 Uganda SDI

The sampling frame for the 2013 Uganda SDI was based on the 2012 EMIS data provided by the Ministry of Education and Sports. The original sample frame contained 17,682 schools with identifier variables from the region to the parish in which each school was located. The sample frame was in terms of the enrolled primary four pupils, who numbered 1.3 million in Uganda's primary schools out of a total pupil body of 8.3 million. The final sample frame was, therefore, purged of the 620 schools that had no primary four pupils, which left the frame with 17,062 primary schools overall.

**Table A 1. 2012 EMIS sample frame by stratum**

| | # District | # County | # Sub-County | # Parish | # Schools | # Primary Four Pupils | # Total Pupils |
|---|---|---|---|---|---|---|---|
| **Central** | 23 | 38 | 215 | 1,301 | 4,533 | 247,189 | 1,691,991 |
| **Eastern** | 32 | 49 | 358 | 1,617 | 4,321 | 417,922 | 2,519,750 |
| **Northern** | 30 | 42 | 256 | 1,160 | 2,652 | 306,759 | 1,849,194 |
| **Western** | 26 | 52 | 345 | 1,563 | 5,057 | 298,824 | 2,017,215 |
| **Kampala** | 1 | 1 | 5 | 89 | 499 | 28,930 | 192,147 |
| **Total** | 112 | 182 | 1,179 | 5,730 | 17,062 | 1,299,624 | 8,270,297 |

*Source*: Author's calculations using MoES 2012 EMIS database

## A2. Stratification of the Sampling Frame for the 2013 Uganda SDI

Although the SDI was usually representative of the national and urban and rural areas, in Uganda it was requested that the survey be also representative at the regional level. Table A 1 shows the overall sample frame by region (stratum). Because of its special status, Kampala was extracted from the Central region and considered a stratum in and of itself. Table A 1 lists the five strata and shows the number of administrative units such as districts, counties and sub-counties within each stratum.

Unfortunately, the sample frame did not contain an urban/rural variable necessary for proper (implicit) stratification of the schools. With the help of the Uganda Bureau of Statistics (UBoS), further work was done to create an urban/rural variable and match each school according to its location. The stratification variables provided the domains (strata) and reporting levels (the analysis tables followed these levels) of the survey. The stratification also depended on the most important indicators to be measured in the survey (absence rates and performance). Finally, it was advisable to order the clusters within each stratum by variables that were correlated with key survey indicators for further implicit stratification when systematic selection was used. The main variable that was used was the facility ownership status (i.e. public/private).

**Table A 2. Distribution 2012 EMIS by urban/rural strata**

| | # Schools | | | # Primary Four Pupils | | |
|---|---|---|---|---|---|---|
| | ***Rural*** | ***Urban*** | ***Total*** | ***Rural*** | ***Urban*** | ***Total*** |
| **Central** | 3,417 | 1,116 | 4,533 | 183,174 | 64,015 | 247,189 |
| **Eastern** | 3,535 | 786 | 4,321 | 340,959 | 76,963 | 417,922 |
| **Northern** | 2,171 | 481 | 2,652 | 240,049 | 66,710 | 306,759 |
| **Western** | 4,135 | 922 | 5,057 | 242,381 | 56,443 | 298,824 |
| **Kampala** | | 499 | 499 | | 28,930 | 28,930 |
| **Total** | 13,258 | 3,804 | 17,062 | 1,006,563 | 293,061 | 1,299,624 |

*Source*: Author's calculations using MoES 2012 EMIS database

Table A 2 shows the sample frame along with the rural/urban distribution of schools and primary four pupils. A multi-stage clustered sampling strategy was adopted in the Uganda SDI. The first stage cluster selection was carried out independently within each explicit stratum. The primary cluster considered was at the county level, which was, therefore, the primary sampling unit (PSU). At the second stage, schools were selected and, at the third stage, teachers and primary four pupils. It was decided than within each stratum, except Kampala, 10 counties would be chosen with probability proportional to size (number of primary four pupils). Note that this implies that in this stage a primary four pupil in each stratum had an equal probability for his/her county to be selected.

## A3. Sample Size and Sample Allocation for the 2013 Uganda SDI

The optimal sample size of any survey depends on the precision required for the main estimates and resource constraints. The precision of survey estimates depends on the sampling and non-sampling errors. Whereas the sampling error can be measured within a survey, this is not the case for the non-sampling error. The sampling error becomes smaller as the sample becomes larger, but the non-sampling error grows with the size of the survey. It was, thus, highly advisable to carry out a survey of reasonable sample size that could be managed with effective quality controls to help contain the non-sampling error.

To approximate the precision of the estimate, a previous similar survey or a survey measuring the same indicator could be very useful. Uganda National Panel Survey (UNPS) 2010/11 visited primary school to measure absence rate – a key variable for the SDI. Note, however, that the UNPS only computed teacher absence from the facility, not from the classroom. The UNPS absence variable was used for simulation of the appropriate sample size. Another important variable for determining optimal sample size is the design effect. It is the ratio of the variance of an estimate based on the actual multi-stage sample design and the same variance, if the sample was a simple random one of the same size. The design effect was a measure of the relative efficiency of the sample design.

**Table A 3. Teachers' absence rate, average, standard errors, and design effect, UNPS 2010/11**

| | Mean | Std. Err. | [95% Conf. | Interval] | Design Effect | Sample Size (Schools) |
|---|---|---|---|---|---|---|
| **Kampala** | 0.211 | 0.068 | 0.077 | 0.345 | 2.204 | 11 |
| **Other Urban** | 0.419 | 0.078 | 0.264 | 0.574 | 2.568 | 25 |
| **Central Rural** | 0.340 | 0.039 | 0.263 | 0.416 | 1.389 | 38 |
| **East Rural** | 0.184 | 0.040 | 0.105 | 0.262 | 1.685 | 35 |
| **North Rural** | 0.380 | 0.031 | 0.320 | 0.441 | 1.328 | 46 |
| **West Rural** | 0.324 | 0.034 | 0.256 | 0.391 | 1.304 | 40 |
| **Uganda** | 0.310 | 0.019 | 0.273 | 0.346 | 1.699 | 195 |

Table A 3 provides information on teachers' absence rate in the UNPS 2010/11, which was estimated at 31.0 percent. It also varied a great deal across strata. The design effect for teachers' absence rate was around 1.7, which indicated a fairly efficient sampling strategy (it is, indeed, not uncommon to have a design effect above three for cluster sampling). The standard errors were, however, relatively large (except at the national level), as shown by the wide confidence intervals. The SDI aimed for a national standard error of around 1.5 percent for absence rate. Using the UNPS as our basis, it was possible to estimate the necessary sample size, for any given standard error, using the following formula:

$$se_{SDI}(\bar{a}) \cdot \sqrt{N_{SDI}} \approx se_{UNPS}(\bar{a}) \cdot \sqrt{N_{UNPS}} \cdot \sqrt{DEFF_{UNPS} / DEFF_{SDI}}$$

Tolerating a higher design effect for the SDI, the final sample was given in Table A 4. It can be tolerated at higher level compared to the UNPS.

**Table A 4. SDI sample allocation across regions**

| | # Schools | # Primary Four pupils | Sample allocation |
|---|---|---|---|
| **Central** | 4,533 | 247,189 | 95 |
| **Eastern** | 4,321 | 417,922 | 95 |
| **Northern** | 2,652 | 306,759 | 60 |
| **Western** | 5,057 | 298,824 | 105 |
| **Kampala** | 499 | 28,930 | 45 |
| **Total** | 17,062 | 1,299,624 | 400 |

## A4. Sampling Schools, Teachers, and Pupils

After the total sample size and its allocation across regions were decided, the next step was to sample the actual schools that would be included in the final sample and the pupils and teachers to be assessed within each school. This was done using a two-stage sampling method. First, in each stratum, schools were chosen within the selected counties, and then, teachers and pupils were selected in a second stage within each selected school.

The schools were chosen using probability proportional to size (PPS), where size was the number of primary four pupils as provided by the 2012 EMIS database. As for the selection of the cluster, the use of PPS implied that each primary four pupil within a stratum had an equal probability for his/her school to be selected.

Finally, within each school, up to 10 primary four pupils and 10 teachers were selected. Pupils were randomly selected among the primary four pupil body, whereas for teachers there were two different procedures for measuring absence rate and assessing knowledge. For absence rate, 10 teachers were randomly selected in the teachers' roster and the whereabouts of those teachers was ascertained in a return surprise visit. For the assessment, however, all teachers who were currently teaching in primary four or taught primary three the previous school year were included in the sample. Then a random number of teachers in upper grades were included to top up the sample. These procedures implied that pupils across strata, as well as teachers across strata and within school (for assessment), did not all have the same probability of selection. It was, therefore, warranted to compute weights for reporting the survey results.

## A5. Weights for Schools, Teachers, and Pupils

To be representative of the population of interest, sample estimates from the 2013 Uganda SDI had to be properly weighted using a sampling weight, or expansion factor. Note that different weights needed to be applied depending on the relevant level for the variable (the school, teacher or pupil). The basic weight for each entity was equal to the inverse of its probability of selection, which was computed by multiplying the probabilities of selection at each sampling stage. All the weights were computed and included in the dataset.

# ANNEX B. DEFINITION OF INDICATORS

| | |
|---|---|
| **School absence rate** | |
| Share of a maximum of 10 randomly selected teachers absent from school during an unannounced visit | It is measured as the share of teachers who are absent from school at a time of an unannounced visit. It is measured in the following way: During the first announced visit, a maximum of ten teachers are randomly selected from the list of all teachers (excludes volunteer and part time teachers) who are on the school roster. The whereabouts of these ten teachers are then verified in the second, unannounced, visit. Teachers found anywhere on the school premises are marked as present. |
| **Classroom absence rate** | |
| Share of teachers who are present in the classroom during scheduled teaching hours as observed during an unannounced visit | The indicator is measured as the share of teachers not in the classroom at the time of an unannounced visit. The indicator is constructed in the same way as school absence rate indicator, with the exception that the numerator now is the number of teachers who are either absent from school, or present at school but absent from the classroom. |
| **Time spent teaching per day** | |
| Amount of time a teacher spends teaching during a school day | This indicator reflects the typical time that teachers spends teaching on an average day. This indicator combines data from the staff roster module (used to measure absence rate), the classroom observation module, and reported teaching hours. The teaching time is adjusted for the time teachers are absent from the classroom, on average, and for the time the teacher teaches while in classrooms based on classroom observations. While inside the classroom distinction is made between teaching and non-teaching activities.<br><br>Teaching is defined very broadly, including actively interacting with students, correcting or grading student's work, asking questions, testing, using the blackboard or having students working on a specific task, drilling or memorization. Non-teaching activities includes working on private matters, maintaining discipline in class or doing nothing and thus leaving students not paying attention. |
| **Minimum knowledge** | |
| Share of teachers with minimum knowledge | It is measured as the percentage of teachers who can master the curriculum they taught. It is based on mathematics and language tests covering the primary curriculum administered at the school and is calculated as the percentage of teacher who score more than 80% on the language and mathematics portion of the test. The test is given to all mathematics or language teachers that taught 3rd grade last year or 4th grade in the year the survey was conducted. |
| Test score | It is measured as the overall score of a mathematics, language and pedagogy tests covering the primary curriculum administered at the school level to all mathematics and language teachers that taught 3rd grade last year or 4th grade in the year the survey was conducted. |

| | |
|---|---|
| **Minimum infrastructure availability** | |
| Unweighted average of the proportion of schools with the following available: functioning electricity and sanitation | It is a binary indicator capturing availability of: (i) functioning toilets and (ii) classroom visibility. Functioning toilets is defined as whether toilets were functioning, accessible, clean and private (enclosed and with gender separation) as verified by an enumerator. To verify classroom visibility we randomly select one 4th grade classroom in which the enumerator places a printout on the board and checks whether it was possible to read the printout from the back of the classroom |
| **Minimum equipment availability** | |
| Unweighted average of the proportion of schools with the following available: functioning blackboard with chalk, pens or pencils, and notebooks or paper | It is a binary indicator capturing availability of: (i) functioning blackboard and chalk and (ii) pens, pencils and exercise books9 in 4th grade classrooms. In one randomly selected 4th grade classroom in the school the enumerator assessed if there was a functioning blackboard by looking at whether text written on the blackboard could be read at the front and back of the classroom, and whether there was chalk available to write on the blackboard. We considered that the classroom meet the minimum requirement of pens, pencils and exercise books if both the share of students with pen or pencils and the share of students with exercise books are above 90%. |
| **Share of pupils with textbooks** | |
| Number of mathematics and language books used in a grade four classroom divided by the number of pupils present in the classroom | The indicator reflect the typical ratio in student to textbooks in the 4th grade classroom. It is measured as the number of students with the relevant textbooks (mathematic or language conditional on which randomly selected class is observed) in one randomly selected 4th grade class and divided by the number of students in that classroom. |
| **Observed pupil-teacher ratio** | |
| Average number of grade four pupils per grade four teacher | This indicator reflects the typical ratio in pupils to teachers in the 4th grade classroom. It is measured as the number of students in one randomly selected 4th grade class at the school. |

# ANNEX C. ADDITIONAL RESULTS

## Figure C 1. Regional distribution of teachers' school and classroom absence rates

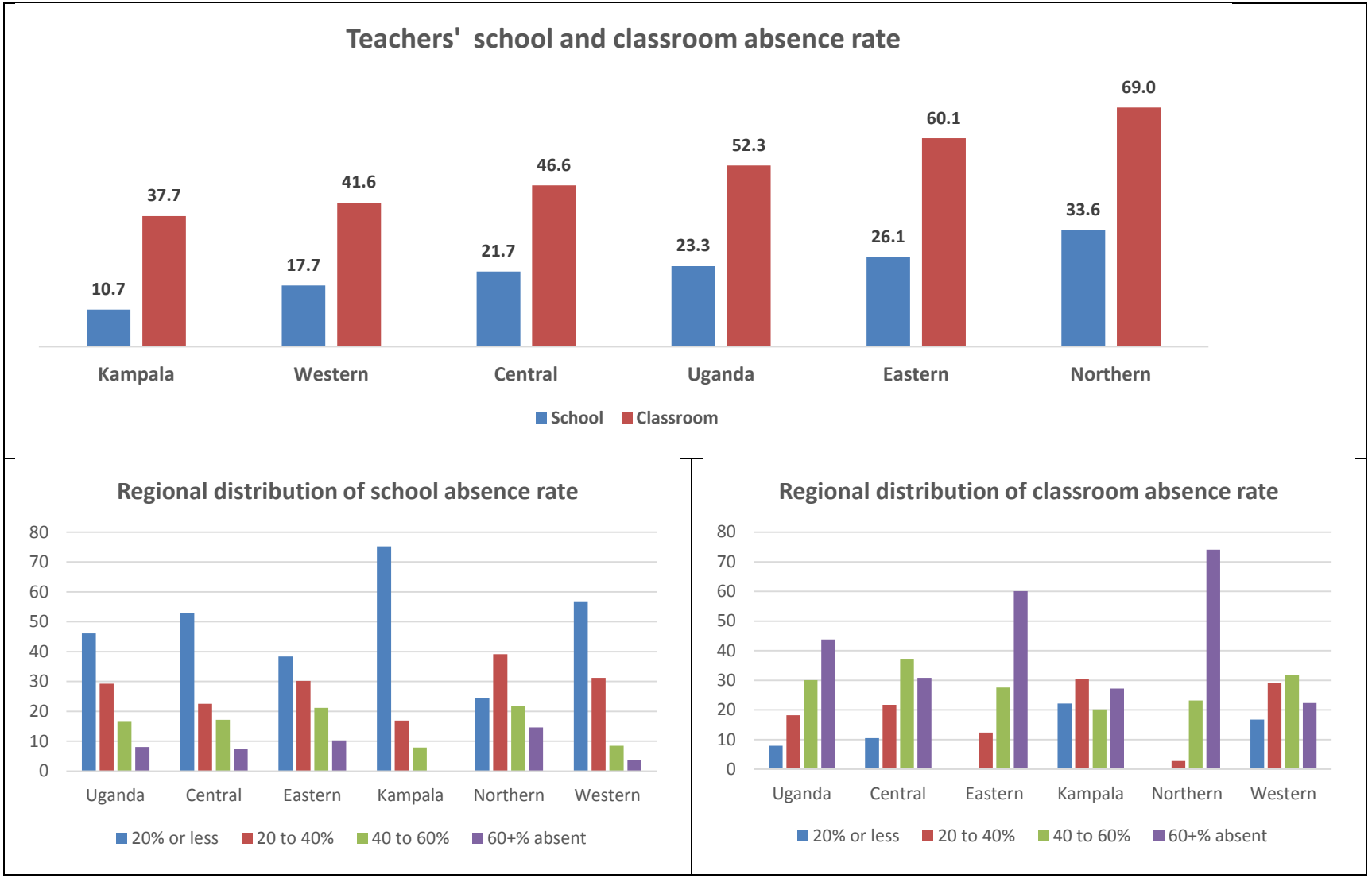
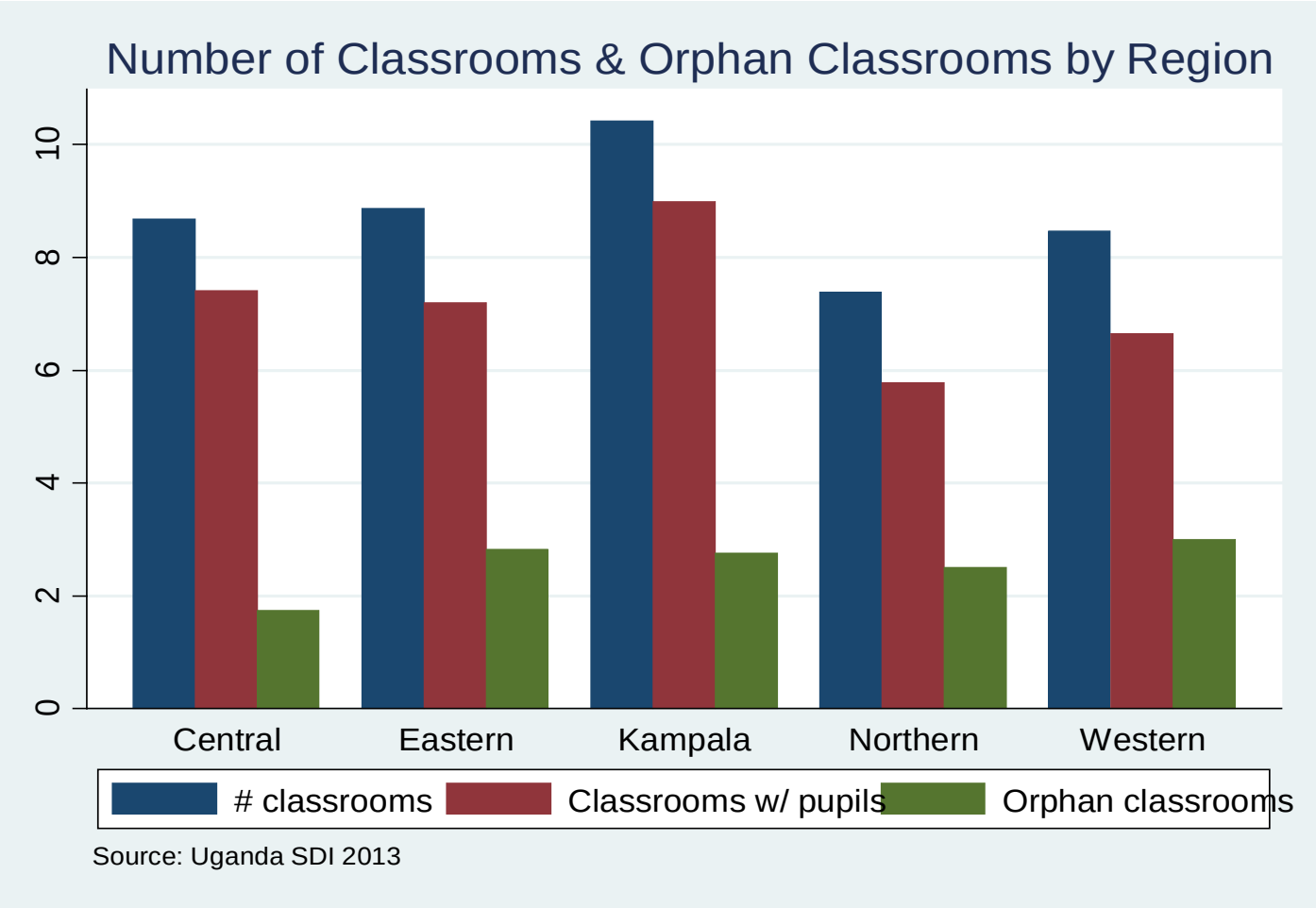


**Figure C 2. Regional distribution of total and orphan classrooms**



## Table C 1. Teacher assessment: disaggregation

| Percent | All | Public | Private | Percent Difference (%) | Urban Public | Rural Public | Percent Difference (%) |
|---|---|---|---|---|---|---|---|
| **English section** | **58.4** | **58.4** | **57.7** | **1.2** | **62.0** | **56.9** | **9.0**** |
| **Mathematics section** | **64.6** | **63.8** | **66.9** | **-4.6** | **68.4** | **62.0** | **10.4**** |
| **Pedagogy section** | **25.5** | **25.9** | **24.3** | **6.5** | **26.8** | **25.5** | **5.2** |
| ***English*** | | | | | | | |
| Minimum knowledge: 100% correct | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Minimum knowledge: 90% correct | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Minimum knowledge: 80% correct | 3.7 | 3.7 | 3.2 | 14.8 | 8.2 | 1.9 | 341.3* |
| Minimum knowledge: 70% correct | 19.1 | 19.1 | 20.0 | -4.3 | 23.5 | 17.3 | 35.4 |
| ***Mathematics*** | | | | | | | |
| Minimum knowledge: 100% correct | 3.6 | 3.8 | 2.9 | 31.6 | 5.1 | 3.3 | 51.5 |
| Minimum knowledge: 90% correct | 10.0 | 9.8 | 10.5 | -6.7 | 11.3 | 9.2 | 22.7 |
| Minimum knowledge: 80% correct | 34.9 | 34.8 | 35.3 | -1.6 | 41.5 | 32.0 | 29.7 |
| Minimum knowledge: 70% correct | 49.6 | 47.8 | 55.4 | -13.8 | 56.5 | 44.1 | 28.0 |
| ***Pedagogy*** | | | | | | | |
| Minimum knowledge: 100% correct | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Minimum knowledge: 90% correct | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Minimum knowledge: 80% correct | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Minimum knowledge: 70% correct | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Observations | 2,162 | 1,748 | 414 | | 303 | 1,445 | |

Note: Level of significance: *** p < 0.01; ** p < 0.05; * p < 0.1.

## Table C 2. Teacher evaluation breakdowns

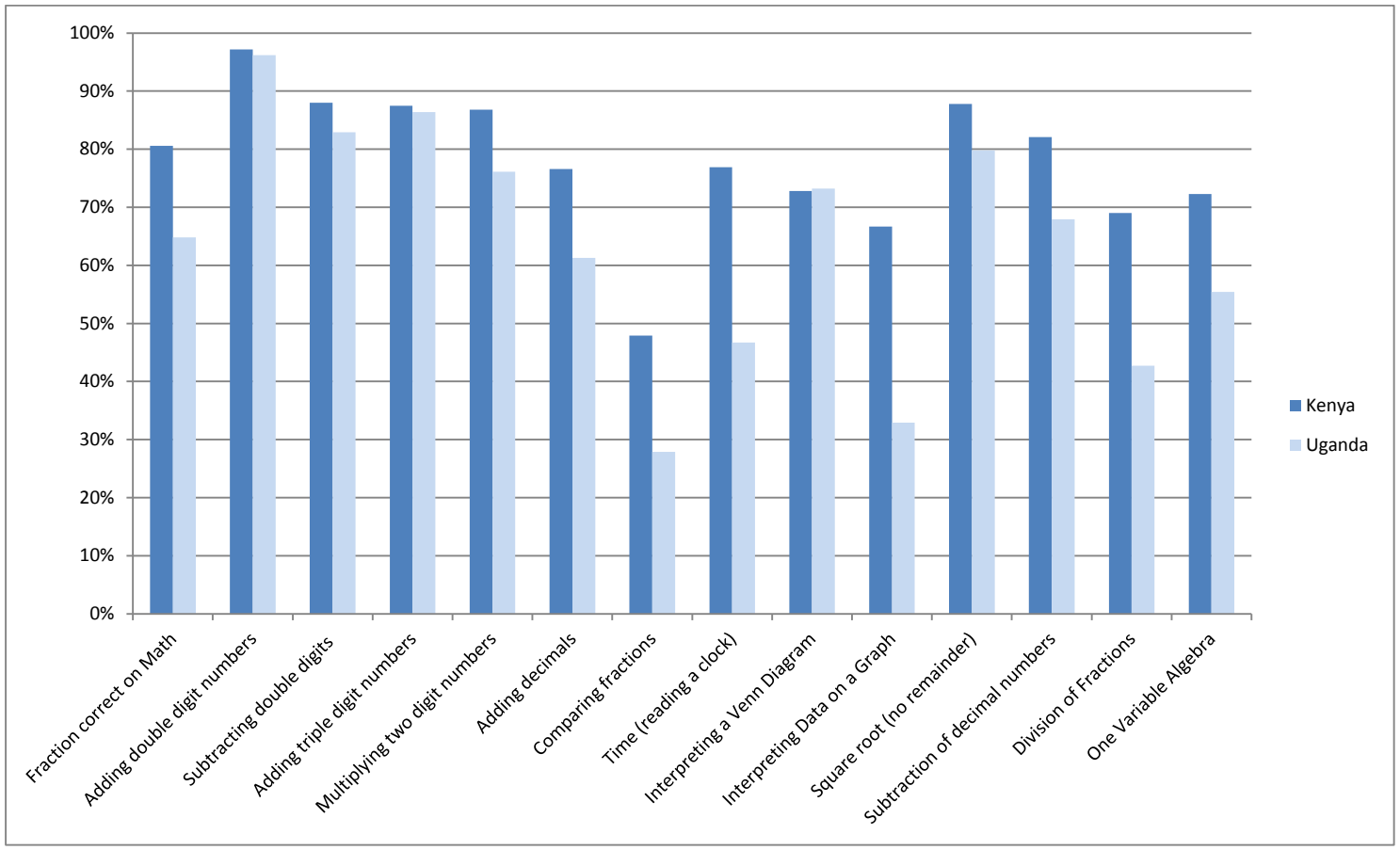
| Average score in percent | All | Public | Private | Percent Difference (%) | Urban Public | Rural Public | Percent Difference (%) |
|---|---|---|---|---|---|---|---|
| **English and Mathematics** | **58.9** | **59.1** | **58.4** | **1.2** | **62.8** | **57.6** | **9.1**** |
| **English** | **58.2** | **58.4** | **57.7** | **1.2** | **62.0** | **56.9** | **9.0**** |
| Grammar | 90.0 | 90.0 | 90.0 | 0.0 | 92.4 | 89.0 | 3.7** |
| Cloze task | 62.0 | 60.9 | 65.2 | -6.6 | 63.2 | 59.9 | 5.5 |
| Reading comprehension | 43.2 | 44.0 | 40.8 | 8.0 | 48.8 | 42.1 | 15.8** |
| **Mathematics** | **64.6** | **63.8** | **66.9** | **-4.6** | **68.4** | **62.0** | **10.4**** |
| Basic mathematics | 66.3 | 65.6 | 68.4 | -4.1 | 69.8 | 63.9 | 9.1*** |
| Advanced mathematics | 61.4 | 60.5 | 64.1 | -5.6 | 65.9 | 58.3 | 13.0*** |
| Comparing fractions | 27.3 | 27.3 | 27.2 | 0.3 | 32.6 | 25.1 | 29.6 |
| Interpreting Venn diagrams | 72.1 | 72.0 | 72.3 | -0.4 | 78.0 | 69.5 | 12.1 |
| Interpreting data on graphs | 31.6 | 31.9 | 30.6 | 4.0 | 34.3 | 30.9 | 11.1 |
| **Pedagogy** | **25.5** | **25.9** | **24.3** | **6.5** | **26.8** | **25.5** | **5.2** |
| Lesson preparation | 31.1 | 31.5 | 29.8 | 5.7 | 31.2 | 31.7 | -1.5 |
| Pupil comparisons | 25.4 | 25.7 | 24.4 | 5.3 | 27.6 | 24.8 | 11.1 |
| Pupil evaluations | 11.3 | 11.8 | 9.8 | 20.2 | 13.6 | 11.0 | 23.1 |
| Observations | 1,168 | 927 | 241 | | 155 | 772 | |

Note: Level of significance: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

## Table C 3. Teachers' mathematics assessment scores

| Average score in percent | Uganda | Central | Eastern | Kampala | Northern | Western | Public | Private | Urban Public | Rural Public |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mathematics (complete test)** | **64.6** | **70.1** | **66.0** | **69.3** | **58.1** | **61.0** | **63.8** | **66.9** | **68.4** | **62.0** |
| Lower primary mathematics | 66.3 | 71.5 | 67.1 | 70.0 | 61.2 | 62.9 | 65.6 | 68.4 | 69.8 | 63.9 |
| Upper primary mathematics | 61.4 | 67.5 | 64.2 | 67.9 | 52.2 | 57.2 | 60.5 | 64.1 | 65.9 | 58.3 |
| Adding double digit numbers | 96.9 | 99.0 | 95.5 | 97.7 | 97.0 | 95.7 | 97.1 | 96.1 | 97.5 | 97.0 |
| Subtracting double digit numbers | 82.9 | 86.2 | 83.4 | 81.1 | 84.2 | 78.2 | 81.9 | 85.7 | 84.3 | 81.0 |
| Adding triple digit numbers | 86.8 | 92.0 | 86.3 | 89.0 | 78.8 | 87.1 | 85.2 | 91.9 | 85.0 | 85.4 |
| Dividing double by single | 72.1 | 71.4 | 77.4 | 70.2 | 64.2 | 72.9 | 71.0 | 75.5 | 78.7 | 67.9 |
| Multiplying two digit numbers | 76.2 | 75.8 | 81.6 | 83.0 | 69.4 | 74.9 | 75.7 | 77.8 | 81.2 | 73.5 |
| Adding decimals | 60.7 | 63.4 | 58.2 | 64.9 | 55.0 | 63.5 | 60.6 | 61.1 | 65.5 | 58.6 |
| Division two-digit # - conceptual understanding | 81.6 | 89.4 | 80.6 | 87.8 | 77.6 | 76.0 | 81.0 | 83.3 | 83.7 | 79.9 |
| Comparing fractions | 27.3 | 32.2 | 26.2 | 32.0 | 26.8 | 22.8 | 27.3 | 27.2 | 32.6 | 25.1 |
| Monetary units - multiplication | 73.2 | 78.8 | 75.1 | 80.4 | 68.9 | 67.5 | 72.6 | 75.3 | 75.0 | 71.6 |
| Geometry - 2D shapes | 91.3 | 95.0 | 92.2 | 98.4 | 82.4 | 91.1 | 90.6 | 93.4 | 95.6 | 88.5 |
| Geometry - types of lines | 87.5 | 90.6 | 88.2 | 93.1 | 79.0 | 88.2 | 87.2 | 88.3 | 91.1 | 85.6 |
| Time (reading a clock) | 44.2 | 54.5 | 43.1 | 58.8 | 38.5 | 36.1 | 45.7 | 39.5 | 44.2 | 46.3 |
| Interpreting data on a Venn diagram | 72.1 | 76.5 | 75.8 | 79.3 | 65.4 | 67.0 | 72.0 | 72.3 | 78.0 | 69.5 |
| Interpreting data on a graph | 31.6 | 36.5 | 35.4 | 33.0 | 26.0 | 26.0 | 31.9 | 30.6 | 34.3 | 30.9 |
| Square root (no remainder) | 80.4 | 86.5 | 80.4 | 86.0 | 68.3 | 81.4 | 78.0 | 88.0 | 83.7 | 75.7 |
| Subtraction of decimals | 68.1 | 73.7 | 69.0 | 74.5 | 59.0 | 66.4 | 65.3 | 76.8 | 75.9 | 60.9 |
| Division of fractions | 42.1 | 52.8 | 42.0 | 36.4 | 44.3 | 30.5 | 39.9 | 49.2 | 41.2 | 39.4 |
| One variable algebra | 55.1 | 66.0 | 57.3 | 71.8 | 43.6 | 46.7 | 52.8 | 62.6 | 58.8 | 50.3 |
| Geometry - perimeter of a rectangle | 63.8 | 75.8 | 69.2 | 63.2 | 44.6 | 58.6 | 63.0 | 66.4 | 73.7 | 58.6 |
| Geometry - area of a rectangle | 60.6 | 70.6 | 65.0 | 67.7 | 44.3 | 55.4 | 58.3 | 67.9 | 68.9 | 53.9 |

**Figure C 3. Kenyan and Ugandan primary teachers' mathematics performance**



## Table C 4. School inputs

| Percent, unless noted | Uganda | Central | Eastern | Kampala | Northern | Western | Public | Private | Urban Public | Rural Public |
|---|---|---|---|---|---|---|---|---|---|---|
| **Minimum equipment availability (% classrooms)** | **80.7** | **81.1** | **67.6** | **92.7** | **93.8** | **83.3** | **80.0** | **82.5** | **85.1** | **78.5** |
| Pupils with pencils (% pupils) | 98.7 | 98.6 | 98.2 | 99.3 | 98.8 | 99.2 | 98.6 | 99.1 | 99.0 | 98.5 |
| Pupils with exercise books (% pupils) | 99.0 | 99.3 | 97.5 | 99.8 | 100.0 | 99.5 | 99.4 | 98.0 | 99.5 | 99.3 |
| Classroom with board (% classrooms) | 99.8 | 100.0 | 100.0 | 100.0 | 100.0 | 99.3 | 99.7 | 100.0 | 100.0 | 99.6 |
| Classroom with chalk (% classrooms) | 98.1 | 100.0 | 99.7 | 100.0 | 98.8 | 94.6 | 97.8 | 99.0 | 97.2 | 98.0 |
| **Minimum infrastructure availability (% schools)** | **53.5** | **49.8** | **50.0** | **67.2** | **65.5** | **52.0** | **58.7** | **38.2** | **66.0** | **56.5** |
| Minimum visibility (% classrooms) | 90.3 | 85.5 | 82.1 | 75.5 | 97.3 | 99.3 | 90.5 | 89.6 | 89.1 | 90.9 |
| Toilet clean (% schools) | 70.7 | 59.1 | 70.1 | 91.7 | 66.8 | 81.8 | 72.1 | 66.5 | 83.2 | 68.7 |
| Toilet private (% schools) | 84.6 | 93.0 | 83.8 | 99.4 | 93.7 | 71.2 | 90.6 | 66.8 | 90.6 | 90.6 |
| Toilet accessible (% schools) | 96.4 | 97.3 | 96.4 | 100.0 | 100.0 | 93.1 | 97.2 | 93.9 | 98.6 | 96.8 |
| **Observed pupil-teacher ratio** | **44.6** | **32.1** | **58.6** | **37.3** | **62.0** | **35.3** | **50.4** | **27.3** | **57.1** | **48.4** |
| **Textbook availability (% pupils)** | **4.6** | **7.4** | **3.8** | **1.4** | **0.8** | **4.9** | **5.6** | **1.2** | **6.6** | **5.4** |
| English | 3.7 | 9.3 | 0.4 | 1.2 | 2.0 | 2.1 | 4.6 | 0.8 | 2.5 | 5.3 |
| Mathematics | 5.2 | 6.0 | 5.6 | 1.8 | 0.0 | 7.4 | 6.4 | 1.4 | 10.0 | 5.4 |

## Table C 5. Teacher effort regressions

| | Correlates with: | |
|---|---|---|
| **Variables** | **School absence rate** | **Classroom absence rate** |
| Female | -2.176 | -10.34*** |
| | (1.990) | (2.308) |
| Age | 0.588** | 0.742** |
| | (0.240) | (0.295) |
| Experience (years taught) | -0.676** | -0.529* |
| | (0.273) | (0.320) |
| Head teacher | 12.09*** | 35.81*** |
| | (4.180) | (4.453) |
| Contract teacher | -6.831** | -6.619* |
| | (2.923) | (3.454) |
| Primary school education | -3.724 | 7.722 |
| | (28.81) | (9.732) |
| Secondary school education | -19.18 | 23.56*** |
| | (27.37) | (6.753) |
| University degree | -25.35 | 17.22** |
| | (27.68) | (6.914) |
| Teacher training certificate | 1.208 | -3.895 |
| | (3.946) | (4.318) |
| *School characteristics* | | |
| School in urban location | -5.270 | 0.187 |
| | (4.264) | (4.846) |
| Total pupils in classroom | -0.00808 | 0.137*** |
| | (0.0310) | (0.0405) |
| Equipment index | -0.792 | -0.328 |
| | (3.191) | (3.147) |
| Infrastructure index | 2.098 | -1.403 |
| | (2.528) | (2.715) |
| School accessible by road | -5.697* | 3.015 |
| | (3.221) | (4.294) |
| Director is a teacher | -3.145 | 1.784 |
| | (2.570) | (2.693) |
| Monday^ | 3.175 | 3.778 |
| | (3.576) | (4.114) |
| Tuesday | 5.583 | 1.161 |
| | (4.512) | (4.205) |
| Wednesday | -2.833 | 6.860 |
| | (3.703) | (4.917) |
| Thursday | 2.447 | 2.146 |
| | (3.933) | (4.308) |
| Constant | 30.85 | -8.937 |
| | (27.50) | (6.156) |
| Observations | 3,733 | 2,913 |
| R-squared | 0.041 | 0.080 |

Note: Robust standard errors in parentheses. ^ = day of the week for the surprise visit at the school. Level of significance: *** p < 0.01; ** p < 0.05; * p < 0.1.

## Table C 6. Pupils' test scores

| Average score in percent | Uganda | Central | Eastern | Kampala | Northern | Western | Public | Private | Urban Public | Rural Public |
|---|---|---|---|---|---|---|---|---|---|---|
| **Overall test score** | **48.6** | **67.5** | **39.1** | **83.0** | **37.9** | **55.9** | **45.3** | **70.3** | **55.5** | **40.9** |
| **English (complete test)** | **47.1** | **68.2** | **36.2** | **85.7** | **35.5** | **55.1** | **43.4** | **71.0** | **54.9** | **38.5** |
| Identify a letter | 86.1 | 96.9 | 83.0 | 99.1 | 78.0 | 88.8 | 84.5 | 96.3 | 91.1 | 81.8 |
| Identify a word | 75.7 | 90.9 | 64.7 | 97.1 | 71.1 | 84.0 | 73.2 | 91.6 | 82.8 | 69.2 |
| Read a sentence | 52.9 | 74.6 | 40.0 | 91.5 | 44.4 | 61.1 | 49.2 | 76.9 | 62.0 | 43.8 |
| Read a paragraph | 9.7 | 22.7 | 5.3 | 50.5 | 2.1 | 8.9 | 6.4 | 30.7 | 12.2 | 4.0 |
| Comprehension | 24.9 | 43.6 | 19.7 | 72.4 | 10.6 | 26.6 | 21.3 | 48.2 | 35.2 | 15.4 |
| **Mathematics (complete test)** | **55.5** | **65.0** | **51.4** | **71.1** | **48.4** | **59.9** | **53.5** | **68.9** | **57.9** | **51.6** |
| Number recognition | 95.9 | 98.9 | 95.3 | 99.7 | 92.7 | 97.0 | 95.4 | 98.8 | 98.1 | 94.3 |
| Ordering numbers | 48.9 | 59.5 | 41.8 | 65.9 | 43.1 | 56.3 | 46.3 | 65.8 | 56.0 | 42.2 |
| Addition (single digits) | 82.4 | 90.3 | 78.9 | 91.0 | 77.4 | 86.1 | 80.9 | 92.4 | 84.0 | 79.6 |
| Addition (double digits) | 56.3 | 68.4 | 48.3 | 79.7 | 50.2 | 63.4 | 53.1 | 76.8 | 58.5 | 50.9 |
| Addition (triple digits) | 56.1 | 70.2 | 43.9 | 81.5 | 51.0 | 67.8 | 53.0 | 76.2 | 59.8 | 50.2 |
| Subtraction (single digits) | 76.2 | 87.9 | 68.9 | 88.9 | 67.7 | 86.0 | 74.2 | 89.0 | 78.5 | 72.4 |
| Subtraction (double digits) | 27.3 | 41.8 | 22.9 | 52.2 | 14.6 | 32.5 | 24.0 | 49.0 | 32.0 | 20.6 |
| Multiplication (single digits) | 23.8 | 34.8 | 21.5 | 49.6 | 12.5 | 26.6 | 20.7 | 43.8 | 28.4 | 17.4 |
| Multiplication (double digits) | 1.5 | 3.0 | 0.8 | 3.9 | 0.6 | 1.9 | 1.2 | 3.5 | 2.0 | 0.8 |
| Multiplication (triple digits) | 0.9 | 1.9 | 0.3 | 2.6 | 0.4 | 1.3 | 0.6 | 3.0 | 0.4 | 0.6 |
| Division (single digits) | 36.8 | 53.8 | 31.4 | 61.7 | 23.7 | 42.1 | 33.8 | 56.7 | 37.9 | 32.1 |
| Division (double digits) | 13.0 | 25.1 | 8.4 | 33.0 | 7.0 | 14.7 | 10.6 | 29.3 | 10.1 | 10.7 |
| Division (analytical) | 14.5 | 19.5 | 16.7 | 22.8 | 5.2 | 14.7 | 13.2 | 23.3 | 14.5 | 12.7 |
| Multiplication (problem solving) | 3.2 | 6.3 | 1.7 | 10.1 | 0.6 | 4.8 | 2.3 | 9.0 | 2.8 | 2.1 |
| Complete sequence | 11.3 | 16.3 | 10.6 | 19.2 | 5.4 | 13.3 | 10.3 | 17.7 | 12.8 | 9.3 |
| **Non-verbal reasoning (complete test)** | **56.9** | **61.8** | **56.1** | **67.1** | **51.3** | **58.3** | **56.1** | **61.9** | **59.4** | **54.7** |

## Table C 7. Correlations between the Service Delivery Indicators and pupil test scores

| | School absence rate | Classroom absence rate | Time spent teaching per day | Share of teachers with minimum knowledge | Teacher test score (English) | Teacher test score (mathematics) | Minimum equipment availability | Minimum infra-structure availability | Observed pupil-teacher ratio | Share of pupils with textbooks |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| **Panel A – All Schools** | | | | | | | | | | |
| Coefficient | -0.485*** | -0.370*** | 0.00086*** | 0.219*** | 0.703*** | 0.407*** | 0.459*** | 0.00874 | -0.00655*** | 0.151** |
| Std. Err | (0.0577) | (0.0445) | (9.85e-05) | (0.0640) | (0.135) | (0.0930) | (0.0877) | (0.0242) | (0.000456) | (0.0657) |
| Observations | 377 | 377 | 364 | 400 | 400 | 399 | 398 | 400 | 396 | 387 |
| Adj. R-square | 0.159 | 0.156 | 0.175 | 0.029 | 0.064 | 0.046 | 0.065 | 0.000 | 0.343 | 0.014 |
| **Panel B- Public Schools** | | | | | | | | | | |
| Coefficient | -0.350*** | -0.292*** | 0.00068*** | 0.192*** | 0.482*** | 0.269*** | 0.411*** | -0.0332 | -0.00569*** | 0.170*** |
| Std. Err | (0.0595) | (0.0475) | (0.000107) | (0.0673) | (0.145) | (0.0943) | (0.0846) | (0.0242) | (0.000519) | (0.0651) |
| Observations | 297 | 297 | 287 | 316 | 316 | 315 | 316 | 316 | 313 | 309 |
| Adj. R-square | 0.105 | 0.113 | 0.125 | 0.025 | 0.034 | 0.025 | 0.070 | 0.006 | 0.278 | 0.022 |

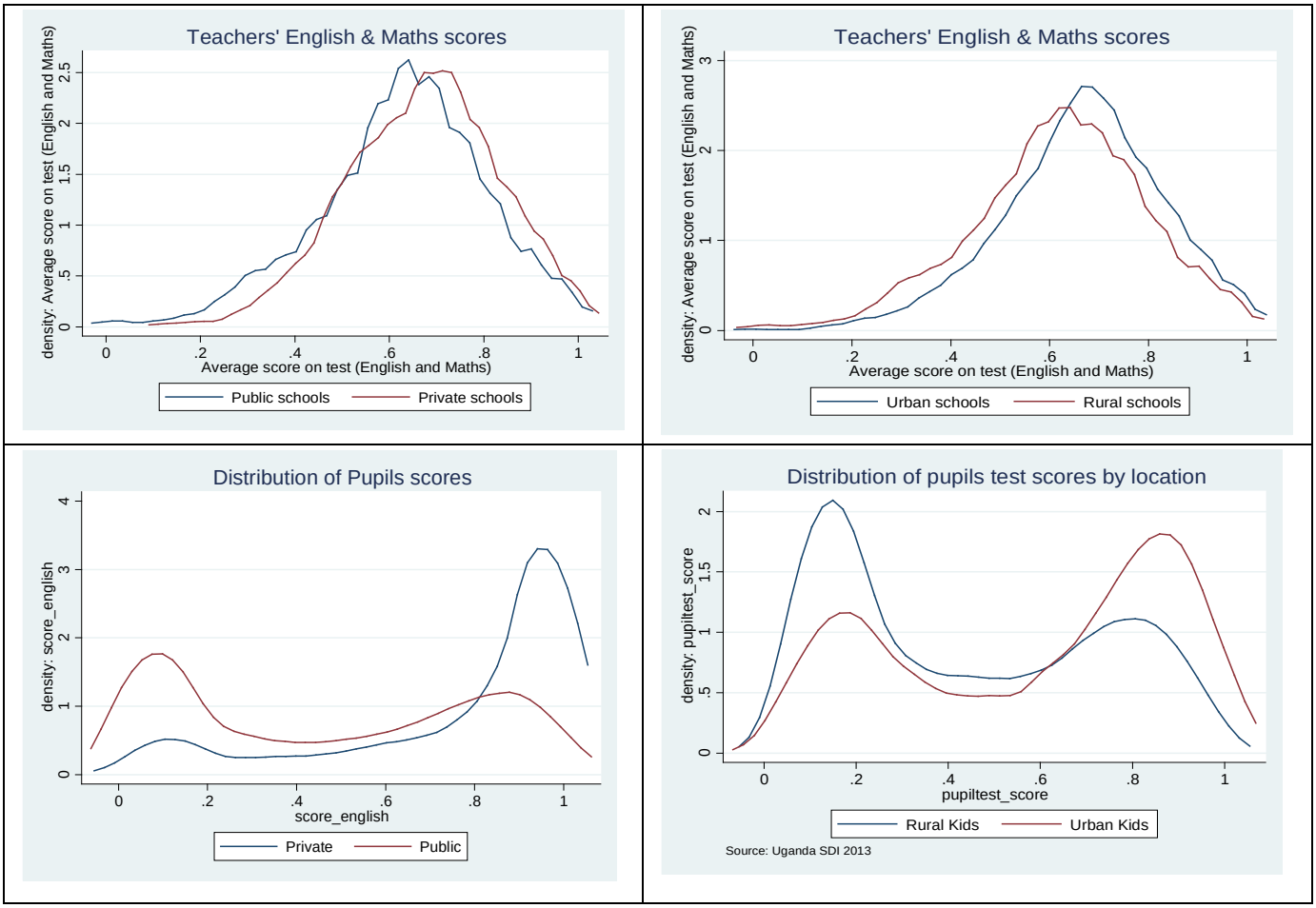
Notes: Each cell represent a regression where test score is regressed on the indicator noted in the column and a constant. The regression uses sampling weights. Panel A is all schools. Panel B is public schools, controlling for rural-urban location. Weighted robust standard errors in parenthesis. Time spent teaching is measured in minutes. Level of significance: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

## Table C 8. Pupil performance correlates

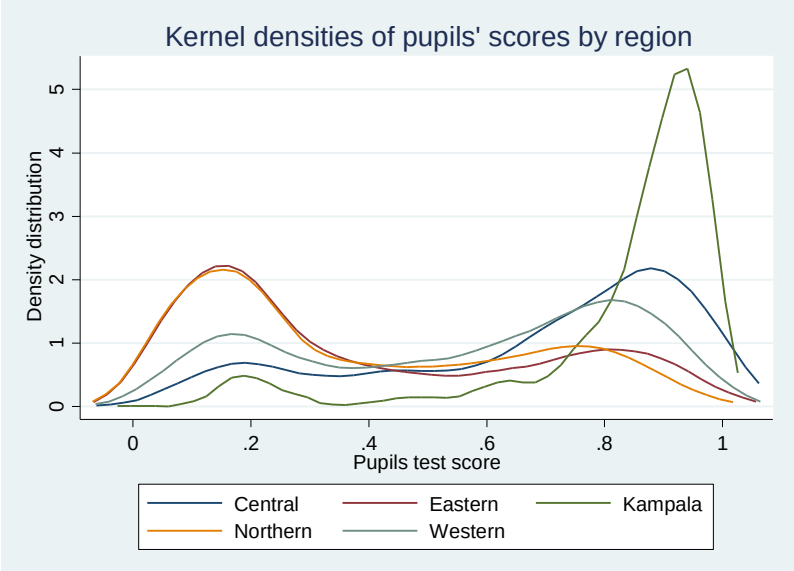
| | Correlates with: | |
|---|---|---|
| **Variables** | **Language** | **Mathematics** |
| Pupil age | -0.678*** | -0.0576 |
| | (0.223) | (0.0850) |
| Pupil female | -0.00894 | -0.0355*** |
| | (0.0156) | (0.00597) |
| Pupil had breakfast | 0.0691*** | 0.0129* |
| | (0.0178) | (0.00770) |
| *Teacher characteristics* | | |
| Teacher female | 0.0660 | 0.0118 |
| | (0.0646) | (0.0249) |
| Teacher age | -1.839** | -0.606* |
| | (0.810) | (0.309) |
| Teacher experience (years taught) | 2.042** | 0.492 |
| | (0.898) | (0.323) |
| Proportion contract teachers | 0.286*** | 0.0947*** |
| | (0.0476) | (0.0236) |
| Proportion with primary education | -0.456** | -0.113 |
| | (0.189) | (0.0790) |
| Proportion with secondary education | -0.358*** | -0.0841** |
| | (0.0968) | (0.0407) |
| Proportion with university degree | -0.444*** | -0.0182 |
| | (0.159) | (0.0701) |
| Proportion with teacher training certificate | 0.0597 | -0.0291 |
| | (0.0880) | (0.0416) |
| Teacher: average mathematics score | 0.138 | 0.143*** |
| | (0.0874) | (0.0416) |
| Teacher: average language score | 0.229 | 0.159** |
| | (0.160) | (0.0668) |
| Teacher: average pedagogy score | 0.286** | 0.0579 |
| | (0.130) | (0.0600) |
| *School characteristics* | | |
| School in urban location | 0.0660 | 0.00650 |
| | (0.0418) | (0.0147) |
| Total pupils in classroom | -0.179*** | -0.0741*** |
| | (0.0383) | (0.0164) |
| Equipment index | 0.0590*** | 0.0104 |
| | (0.0228) | (0.0107) |
| Infrastructure index | -0.0370* | 0.00429 |
| | (0.0222) | (0.00919) |
| School accessible by road | 0.0434 | 0.0199 |
| | (0.0405) | (0.0165) |
| Director is a teacher | 0.0495** | 0.0231** |
| | (0.0228) | (0.00949) |
| Constant | 86.54*** | 51.35*** |
| | (25.68) | (10.07) |
| *Observations* | 3,947 | 3,947 |
| *R-squared* | 0.276 | 0.184 |

Note: Robust standard errors in parentheses. Level of significance: *** p < 0.01; ** p < 0.05; * p < 0.1

## Figure C 4. Teachers' knowledge and pupils' performance by location and school ownership




## Figure C 5. Pupils' performance by regions



## Table C 9. SDI At-a-Glance: Private schools only

| Private schools only | Uganda 2013 | Average SDI | Kenya 2012 | Mozambique[b] 2014 | Nigeria[a] 2013 | Senegal[b] 2010 | Tanzania 2014 | Tanzania[b] 2010 | Togo 2013 |
|---|---|---|---|---|---|---|---|---|---|
| **Teacher Ability** | | | | | | | | | |
| Minimum knowledge (% teachers) | 14.7 | **19.8** | 52.6 | Not Available | 7.7 | Not Available | 20.8 | Not Available | 3.1 |
| Test score (out of 100) | 41.5 | **45.3** | 60.4 | Not Available | 40.4 | Not Available | 45.5 | Not Available | 39.0 |
| **Teacher Effort** | | | | | | | | | |
| School absence rate (% teachers) | 14.2 | **10.8** | 11.4 | Not Available | 5.5 | Not Available | 6.7 | Not Available | 16.1 |
| Classroom absence rate (% teachers) | 40.5 | **29.9** | 29.3 | Not Available | 9.5 | Not Available | 41.8 | Not Available | 28.4 |
| *Scheduled teaching time* | *7h 33min* | ***6h 04min*** | *5h 55min* | *Not Available* | *5h 24min* | *Not Available* | *5h 54min* | *Not Available* | *5h 33min* |
| Time spent teaching per day | 4h 27min | **4h 07min** | 3h 44min | Not Available | 4h 23min | Not Available | 4h 19min | Not Available | 3h 43min |
| **Availability of Inputs** | | | | | | | | | |
| Observed pupil-teacher ratio | 28.9 | **27.4** | 22.9 | Not Available | 22.1 | Not Available | 37.0 | Not Available | 26.2 |
| Textbook availability (% pupils) | 1.9 | **38.3** | 58.6 | Not Available | 54.6 | Not Available | 23.9 | Not Available | 52.6 |
| Minimum equipment availability (% classrooms) | 84.0 | **62.8** | 92.1 | Not Available | 78.3 | Not Available | 28.8 | Not Available | 30.8 |
| Minimum infrastructure availability (% schools) | 42.9 | **51.9** | 57.5 | Not Available | 36.6 | Not Available | 83.4 | Not Available | 39.2 |
| **Pupil Learning** | | | | | | | | | |
| Language and mathematics test score (out of 100) | 70.3 | **73.9** | 85.6 | Not Available | 61.0 | Not Available | 87.2 | Not Available | 65.2 |
| Language test score (out of 100) | 71.0 | **76.8** | 90.4 | Not Available | 64.1 | Not Available | 90.8 | Not Available | 67.8 |
| Mathematics test score (out of 100) | 54.6 | **58.8** | 67.3 | Not Available | 46.8 | Not Available | 71.9 | Not Available | 53.3 |

Note:
a. Values for Nigeria are the weighted average of the four states surveyed, namely Anambra, Bauchi, Ekiti, and Niger.
b. In Mozambique, and the pilot surveys of Senegal, and Tanzania 2010 only public schools were surveyed.
c. These numbers reflect the updated SDI methodology. More information on SDI methodology can be found at www.SDIndicators.org.
d. Full definitions of the indicators are found in Annex B.

## Table C 10. SDI At-a-Glance: All schools

| All schools | Uganda 2013 | Average SDI | Kenya 2012 | Mozambique[b] 2014 | Nigeria[a] 2013 | Senegal[b] 2010 | Tanzania 2014 | Tanzania[b] 2010 | Togo 2013 |
|---|---|---|---|---|---|---|---|---|---|
| **Teacher Ability** | | | | | | | | | |
| Minimum knowledge (% teachers) | 19.5 | **14.6** | 40.4 | 0.3 | 3.7 | Not Comparable | 15.6 | Not Comparable | 1.6 |
| Test score (out of 100) | 45.3 | **43.0** | 57.1 | 26.9 | 32.9 | Not Comparable | 46.5 | Not Comparable | 35.6 |
| **Teacher Effort** | | | | | | | | | |
| School absence rate (% teachers) | 23.3 | **18.6** | 14.1 | 44.8 | 13.7 | 18.0 | 15.0 | 23.0 | 20.5 |
| Classroom absence rate (% teachers) | 52.3 | **39.8** | 42.1 | 56.2 | 19.1 | 29.0 | 46.6 | 53.0 | 35.8 |
| *Scheduled teaching time* | *7h 19min* | ***5h 34min*** | *5h 37min* | *4h 17min* | *4h 53min* | *4h 36min* | *5h 54min* | *5h 12min* | *5h 29min* |
| Time spent teaching per day | 3h 17min | **3h 02min** | 2h 49min | 1h 41 min | 3h 26min | 3h 15min | 2h 59min | 2h 04min | 3h 29min |
| **Availability of Inputs** | | | | | | | | | |
| Observed pupil-teacher ratio | 44.6 | **40.4** | 35.2 | 21.4 | 21.6 | 34.0 | 40.5 | 74.0 | 29.7 |
| Textbook availability (% pupils) | 4.5 | **37.1** | 48.0 | 68.1 | 38.2 | Not Comparable | 25.9 | Not Comparable | 68.5 |
| Minimum equipment availability (% classrooms) | 80.6 | **60.5** | 78.8 | 76.8 | 54.8 | Not Comparable | 62.0 | Not Comparable | 26.4 |
| Minimum infrastructure availability | 53.4 | **38.1** | 59.5 | 29.1 | 18.5 | Not Comparable | 36.6 | Not Comparable | 22.3 |
| **Pupil Learning** | | | | | | | | | |
| Language and mathematics test score (out of 100) | 48.6 | **49.6** | 72.0 | 20.8 | 32.2 | Not Comparable | 49.5 | Not Comparable | 45.7 |
| Language test score (out of 100) | 47.1 | **49.5** | 75.4 | 18.7 | 31.4 | Not Comparable | 48.2 | Not Comparable | 45.5 |
| Mathematics test score (out of 100) | 55.5 | **47.3** | 59.0 | 25.1 | 31.9 | Not Comparable | 57.6 | Not Comparable | 44.6 |

Note:
a. Values for Nigeria are the weighted average of the four states surveyed, namely Anambra, Bauchi, Ekiti, and Niger.
b. In Mozambique, and the pilot surveys of Senegal, and Tanzania 2010 only public schools were surveyed.
c. These numbers reflect the updated SDI methodology. More information on SDI methodology can be found at www.SDIndicators.org.
d. Full definitions of the indicators are found in Annex B.

| Public schools only | Uganda 2013 | Average SDI | Kenya 2012 | Mozambique 2014 | Nigeriaa 2013 | Senegal 2011 | Tanzania 2014 | Tanzania 2011 | Togo 2013 |
|---|---|---|---|---|---|---|---|---|---|
| **Teacher Ability** | | | | | | | | | |
| Minimum knowledge (% teachers) | 19.4 | **12.7** | 34.8 | 0.3 | 2.4 | Not Comparable | 15.6 | Not Comparable | 0.9 |
| Test score (out of 100) | 45.5 | **42.0** | 55.6 | 26.9 | 30.5 | Not Comparable | 46.6 | Not Comparable | 33.9 |
| **Teacher Effort** | | | | | | | | | |
| School absence rate (% teachers) | 26.6 | **20.1** | 15.2 | 44.8 | 16.9 | 18.0 | 15.3 | 23.0 | 22.6 |
| Classroom absence rate (% teachers) | 56.3 | **42.1** | 47.3 | 56.2 | 22.8 | 29.0 | 46.7 | 53.0 | 39.3 |
| Time spent teaching per day | 2h 55min | **2h 53min** | 2h 30min | 1h 41 min | 3h 10min | 3h 15min | 2h 57min | 2h 04min | 3h 15min |
| *Scheduled teaching time per day* | *7h 13min* | ***5h 31min*** | *5h 31min* | *4h 17min* | *4h 44min* | *4h 36min* | *5h 54min* | *5h 12min* | *5h 28min* |
| **Availability of Inputs** | | | | | | | | | |
| Observed pupil-teacher ratio | 50.4 | **42.1** | 39.3 | 21.4 | 21.5 | 27.2 | 40.6 | 52.0 | 31.4 |
| Textbook availability (% pupils) | 5.6 | **37.2** | 44.5 | 68.1 | 33.7 | 18.0 | 25.9 | 19.7 | 76.0 |
| Minimum equipment availability (% classrooms) | 80.0 | **57.8** | 74.3 | 76.8 | 48.2 | Not Comparable | 62.4 | Not Comparable | 24.3 |
| Minimum infrastructure availability (% schools) | 58.7 | **36.2** | 60.2 | 29.1 | 13.4 | Not Comparable | 36.0 | Not Comparable | 14.4 |
| **Pupil Learning** | | | | | | | | | |
| Language and mathematics test score (out of 100) | 48.4 | **45.4** | 69.4 | 20.8 | 25.1 | Not Comparable | 49.2 | Not Comparable | 38.1 |
| Language test score (out of 100) | 43.4 | **44.8** | 72.5 | 18.7 | 23.3 | Not Comparable | 47.9 | Not Comparable | 36.9 |
| Mathematics test score (out of 100) | 53.4 | **45.2** | 57.4 | 25.1 | 28.2 | Not Comparable | 57.5 | Not Comparable | 41.3 |

Note:
a. Values for Nigeria are the weighted average of the four states surveyed, namely Anambra, Bauchi, Ekiti, and Niger.
b. These numbers reflect the updated SDI methodology. More information on SDI methodology can be found at www.SDIndicators.org.
c. Full definitions of the indicators are found in Annex B.

# VIII. REFERENCES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